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Foreword

Welcome to Edinburgh, and welcome to the fifth Narrative and Interactive Learning Environments conference. Traditionally NILE has been held in Edinburgh in August at a time when the city is celebrating art and literature in the Festival Fringe and Book Festival. Of course, as Edinburgh is the first World City of Literature, we celebrate the spoken and written word all year round here. Stories also have a place in the heart of Edinburgh; indeed in the heart of Scotland as a country. The Scottish Storytelling Centre, directed by our opening key note speaker Dr Donald Smith, has done much to revitalise the art and heritage of storytelling in Scotland.

At NILE we are particularly interested in the interplay between storytelling, learning and technology. The discussions you will hear at the conference will be about the ways in which we can develop technology to support learners develop storytelling skills. We'll hear about why it's important for learners, particularly young people, to tell stories and what they learn from doing so. We'll hear from researchers and software developers who have taken on the task of designing software to help learners express their creative ideas and take part in stories. Sometimes the software is designed to help learners do a traditional literacy task; sometimes it opens up new worlds for storytelling by using new media formats. We are delighted at the variety and quality of the papers you will see presented at the conference. We are particularly pleased that so many PhD students have contributed to the conference, as their work is the future of the field. The papers cover a mixture of theoretical discussions about learning and narrative, more technical software design topics, and empirical results from field studies with learners.

For the first time this year, we are having an Educators' Day (7th August), aimed primarily at teachers and others who work directly with learners. It's always been an important part of NILE to include people from different disciplines, so we are looking forward to sharing ideas between researchers and educators. Educators' Day has a theme of narrative in the new media of computer games and digital comics. Dr Andrew Burn will open the day with some insight into how our concepts of narrative may change as we embrace new forms of media, particularly game design. This will be followed with some experiences from a teacher and a pupil who have been involved in the Adventure Author game design project, which is run at Heriot-Watt University. The day also includes a hands-on workshop about comics, graphic novels and manga, run by Dr Mel Gibson. We hope you enjoy meeting teachers, and hope it may lead to fruitful collaborations in the future.

Another special event this year is the launch of the book "*Inside Stories: A Narrative Journey*". It is written by NILE community founder members: myself, Lisa Gjedde, Ruth Aylett, Rose Luckin and Paul Brna. As those of you who attended NILE conferences before know, Paul Brna was the driving force in the previous NILE conferences and brought together the *Inside Stories* authors on the DAPPPLE project – for this we are very grateful! The book was partly inspired by conversations we had with participants at previous NILE conferences, and is written in the form of a storybook. We still have plans to write more sections on new topics – one of the joys of print on demand technology – so do come and talk to us if you think of an issue we should have covered.

Enjoy the conference, and we hope you return home with many tales to tell of Edinburgh, and of the people you met here.

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22nd July 2008

Managing Emergent Narrative

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Abstract¹

In this paper, we consider the role of narrative management in a character-based emergent narrative framework. The paper defines the problem and considers related work. It evaluates the role of the Game Master in non computer-based role-playing games and presents two initial implementations of a story facilitator within a character-based system using the FAtiMA agent architecture. Finally it considers what further work is required.

1 Introduction

Character-based or emergent narrative (EN) has been seen as a way of dealing with the conflict between the requirements of pre-authored plot and user interactive freedom sometimes known as the narrative paradox [2] in interactive narrative. Here, the narrative experience consists of a dynamic process in which human users and synthetic characters jointly control and determine the unfolding of the narrative through their own autonomous choice of actions. In a pedagogical context, it supports user role-play in which the user's choices genuinely impact the direction of the narrative, with the potential for obtaining the cognitive, affective and educational advantages of live role-play.

However an argument against this approach is that just as a plot-directed approach may violate the behavioural consistency and thus the believability of characters, so autonomous characters may fail to produce any coherent, interesting narrative structure [20]. A further issue for educational applications is that even an interesting narrative structure may still fail to meet the pedagogical objectives of the role-play. Yet adopting the frequently-used strategy of branching narrative runs the risk of alienating the learner by making it all too clear what learning the author intends the story to convey.

As part of a programme of work around the concept of emergent narrative, a number of solutions to this problem have been considered. For example, one may modify the architecture of synthetic characters such that their choice of autonomous action is influenced by dramatic requirements as well as their immediate goals [18]. In this paper however we argue that story facilitation, drawing on the functionality of the role-playing game (RPG) Game Master [9, 17, 32, 26, 27], is also worth investigating. The term story facilitation rather than management is used to emphasise the point that this is not a case of overruling the autonomous actions of either the user or the synthetic characters. It is a mechanism for shaping rather than for directing that is being investigated.

The problem of reconciling narrative structure with autonomous characters can actually be seen as a version of a very well-known problem in robotics. This is to accomplish tasks while retaining the ability to react to a changing environment. In both cases some higher-level structure is desired without removing the ability of agents to respond to what is happening around them. The classical view of planning as a one-to-many expansion of predetermined actions to be executed in the given sequence [11] corresponds

¹ This paper is substantially that published and presented at the Second International Conference on Intelligent Technologies for Interactive Entertainment (ICST INTETAIN '08), January 8–10, 2008, Cancun, Mexico.

to the plot-driven view of narrative. The purely character-based view of narrative has a certain analogy to behavioural robotics [6] in which all of an agent's actions are determined by the current world state. In robotics, it came to be accepted that classical planning produced brittle and unresponsive systems [6]. However, purely behavioural systems could not offer any guarantee that desired outcomes would be reached and were plagued by problems associated with conflict resolution between competing behaviours and local minima [1]. Heterogeneous systems, combining planning with reactive execution in more sophisticated relationships than in the two extreme positions were seen as a solution [12]. Two such relationships are worthy of note in the context of interactive narrative.

The first of these was the use of planning as a resource by execution agents [33]. This requires agents to be able to detect local problems and refer to planning for global solutions. In interactive narrative, characters would need to be able to detect dramatic problems such as lack of narrative progression, absence of dramatic tension or possibly failure to reach specified states. A solution would then be requested from the story facilitator. In order to prevent such solutions conflicting with character consistency, negotiation would be required. This approach seems worth pursuing but is not the one adopted here due to its inherent complexity.

A second approach sees planning as a context-setter for execution behaviours through the communication of constraints [1]. In robotics, where the real world is generally outside the control of the planning system, execution agents were given higher level information about which behaviours should be active in which contexts, so that for example obstacle avoidance could be turned off if a robot was trying to dock. In a virtual or story world however, the story facilitator has a great deal of control over the environment external to the characters. Mechanisms such as determining the outcome of physical actions, generation of exogenous events or the introduction of objects or opponents are well-used components of the Game Master's (GM's) repertoire in table-top role-playing. They are also used by the coordinator or facilitator of educational role-play. It is this approach we discuss below.

2 Story-management in interactive systems

Views of story-management are strongly determined by views of interactive narrative itself. It is worth bearing in mind two significant differences between the emergent narrative view adopted here and the views embodied in the related work considered.

An assumption of plot-based approaches is that the plot defines 'the' story. This does not require the story to be exactly the same each time the interactive system runs since this is clearly not true of branching narrative approaches. However it does embed the concept of spectator, in that 'the' story in a given run is the one presented actively by the system to the user. Story management runs at the service of this story. In character-based narrative on the other hand, there can be as many stories being created concurrently as there are characters, whether computer-driven or role-played by users. Story becomes situated in the experience of each character and is internalised in a process we describe as storification [3] rather than being visible from a single standpoint as 'an' external artefact. Note that this is a narrative version of the core idea of constructivist learning theory that the learner creates their own meanings within the educational process.

Given the difficulty of authoring detailed interlocking multiple stories, never mind interactive variations on them all, this has an impact both on the authoring process – which becomes more declarative - and the subsequent management process. There is an interesting parallel here with Live Action Role Playing games (LARP) in which the aim is for every one of multiple participants to have a satisfying experience, in some cases of a specifically narrative type, which is jointly constructed by their activity and shaped in a limited number of ways by the GM.

The second difference follows from the first. With multiple stories, rather than checking adherence to any specific story, management focuses on character engagement in the overall process. This requires metrics

allowing engagement to be detected, as with the human GM [17]. Facilitation and shaping rather than direction is then needed.

These differences limit the usefulness of some existing work for story management as envisaged here. For example, one view of story management sees it as plan repair, consistent with a plot-centred approach in which user interactivity is a source of plan failure. In [25], re-planning at execution time finds alternative ways of achieving goals that user interaction may have failed. From the perspective of emergent narrative (EN), a problem with this approach is that it easily produces out-of-role behaviour by characters that exist only in the service of the plot.

Treating characters as semi-autonomous makes story management akin to film direction [4, 19], where again the director's vision of the single story that will be presented to the audience is central. Here the issue becomes one of the levels of direction, still in the service of 'the' story. For example, if characters have a multi-level architecture as is common in robotics, one may intervene at the level of behaviours or at the level of plans. In [4], three levels of direction were identified: overruling the character's internal architecture completely; selecting actions that are not contradicted by the character's behaviour selection system; modify the way in which an action selected by the behaviour system is carried out.

Taking this approach to its conclusion [20] argues against character autonomy on the basis that characters making local decisions cannot be responsible for the global story-state. This approach recasts story management as selection of beats from a comprehensive database, which can be thought of in the robotics context already mentioned as universal plans. Interactivity is dealt with by aiming for a complete coverage of the possible beats in relation to user interaction. This approach rests on an argument that high-level management concerned with episodes or whole scenes is not enough, and once management intervenes inside scenes, character autonomy is an obstacle.

However in the emergent narrative approach, global story-state only has to have certain characteristics, rather than being composed of definite sequences. This is much more like the approach of Weyhrauch [31] which Mateas and Stern [20] are specifically arguing against. Weyhrauch [31] formulated a story as a set of plot-points, similar in nature to the GM way-points discussed below. The drama manager monitored the state of the world and looked for triggers defining a plot-point transition. It treated this in a way analogous to a move in chess, with its own repertoire of changes in the world as possible countermoves. It evaluated all possible future story-states added to the current story-state on some metric and made what it assessed to be its 'best' move. This seems a potentially expensive process and raises the question of what would make a suitable evaluation metric. It is however an approach on which the work of section 4 has drawn.

3 The role of a Game Master (GM)

The role of the GM is a recurrent theme in interactive storytelling research [9, 24, 17, 7, 32, 27, 29] and the activity of the GM is often described at a high-level so as to illustrate successful real-time interactive storytelling management. The basic principles of GM operation have been the subject of investigation within hobbyist communities [e.g. 9, 32] and have been described in RPG game products and debated in hobbyist conventions [e.g. 5]. However the cognitive processes and low-level mechanics involved in both single-player and multi-player RPGs are complex and have not been studied in any detail. The best work to date has been carried out in the hobbyist environment [e.g. 16, 14, 32, 21]. While some recent empirical work has been carried out on the functionality and communication of GMs and players in Pen-and-Paper RPGs as well as multi-player digital RPGs [27, 29, 30, 28 (in review)], further work is required in order to formalize the role of the GM in RPGs, and more importantly to identify the GM functions and mechanisms that can be transferred to and implemented in an interactive drama context.

The inspiration taken from earlier work in robotics in the current study relates GM-controlled processes in run-time to hierarchical planning where the planning activity consists of guiding characters through story "way-points" which have some similarity to the plot points discussed by Weyhrauch [31]. A "way-point",

in this particular context, could be regarded as a particular state of the interactive narrative, with way points differentiated from each other by a set of changes in both the characters and the environment with an overall dramatic purpose.

A GM's planning activity can be viewed as constraining the range of behaviors used by characters to act in a story environment so as to make it likely that desired way points are achieved. With respect to the EN theory, the GM would not directly control the behaviors of Non-Player Characters (NPCs) but initiate goals and configure autonomous NPCs so as to shape (rather than control) the unfolding of a story. From a technical perspective, NPC behaviors could be run autonomously via AI software, independently from each other and information and intentions could be exchanged between GM and NPCs via an agent framework.

In this section, this idea is taken a step further by focusing on three relevant features of game-mastering: The distribution of authorial control in RPGs, the abstraction level(s) at which the GM operates when managing interactive stories, and the flow or run-time planning of game-mastering. While the following is admittedly brief, it should give some basic insight into both the complexity of the GM's role in multi-player RPGs, and the need for a proper analysis of means by which the GMs conceptualize and manage digital interactive storytelling environments.

3.1 Principles of authorial control in RPGs

Game Masters in Pen-and-Paper RPGs may have a range of responsibilities, including the provision of information about the fictional game world and developing the game storyline in collaboration with the players. The players formulate responses to changes in the fictional game world state based on the input and descriptions provided by the GM, and construct their private mental models of the events taking place [27]. The GM is thus not only in charge of the story and of communicating the state of the environmental content, but also of the flow of the game process.

A key concept of RPGs is **authorial control**, and how this is distributed between the players and the GM(s) of a game session [32]. Understanding how authorial control can be distributed in these games is the first step towards studying GM planning techniques and processes.

The way that authorial control is divided in Pen-and-Paper RPGs, and the variations in this feature during game play, impacts on the available space for maneuvering and management that the GM has, and therefore directly upon the formation of the collaborative story. The GM's ability to make decisions about the game world and story as well as the entities involved (for example, Non-Player Characters - NPCs), depends on the agreement between the game participants as to how authorial control is to be shared. In essence, a Pen-and-Paper RPG could operate without a GM. The greater the authorial control given to the participating players, the more adaptable and flexible a GM has to make their game story management. However the ability of a player to affect the fictional game world in a RPG need not be directly proportional to their actual level of control over the game story, giving an illusion of greater control than is in fact available. For example, if a player destroys an object for which the GM had planned a specific use in the game story, the GM may subsequently introduce an alternative with the same story-based functionality.

The relationship between the perceived and actual authorial control of players is important to story management. In extremes such as those represented by most digital RPGs (e.g. *Oblivion*, *Neverwinter Nights*, *Fallout*), players are usually limited to basic interactions with game world objects and very simple conversations with NPCs [13].

In this style of story management, the players have little or no effective impact on the game story. The GM maintains a high level of story control and defines the level of variance permitted to the players. The GM may manipulate the event flow to eliminate outcomes of player actions that are undesired and actual player control of the story may be limited to a few simple branches. However once an increased level of actual authorial control is given to the players, their decisions have more impact on the collaborative narrative [32]; and the demands on the GM to maintain flexibility as well as narrative coherence increase.

3.2 Abstraction level(s)

The distribution of authorial control and the relationship between actual and illusory control of the interactive story are significant high-level principles in relation to the storytelling process in Pen-and-Paper RPGs with a GM. However the underlying cognitive processes relating to the management and development of the interactive story are complex. The GM will typically have a series of story-based goals: a deep understanding of how these goals are managed across different levels of abstraction is critical for the successful representation of GM activity. This is a difficult area given the wide range of actions covered by GMs over different types of RPGs.

A GM manages goals at different levels of abstraction and both the overall flow of the story and the nature and effects of interaction with the players will normally be considered at multiple levels. There is a high-level, with very little detail, at which the major interactions and events are considered for inputs and outputs. This level consists of identifying what is necessary for major events to occur, in moving between way points, and what would be their repercussions on the succeeding parts of the story. Story parts are considered at lower levels, depending on how important they are or have become as a result of interaction.

While the number of abstraction levels probably varies from story-to-story or GM-to-GM, the following example gives a fair representation of the possible different levels of abstraction involved in the GM's role (Table 1).

s	The GM intends the player to gain information
Abstraction level 2	GM decides the bearer of information
Abstraction level 3	GM decides the details of interaction between players and bearer
Lower-level	When does it happen? What is said by NPCs? What is the furniture, location?

Table 1. Example abstraction levels

These levels of abstraction are interdependent given that high-level decisions determine actions/decision at the lower levels and low-level actions often also affect high-level planning and the course of a story. From a planning perspective, a common idea in hierarchical approaches such as the one shown in Table 1, where lower-levels are expansions of higher-levels is that for the higher-level goals to succeed, the lower-level ones must too. In the case of this example, at planning time, the high-level "Pass information" goal, would be expanded into sets of lower-level goals so as to satisfy the high-level goal in a number of different ways. Generating alternative sets of low-level goals in order to achieve success for a high-level goal allows the planning system to cover different users or situations and gives more planning flexibility. It also means that failure to achieve pre-conditions at the low-level does not always imply failure at the high-level as alternative ways to achieve a goal can be triggered via re-planning at the lower level. This flexibility is central to the task of the GM.

However, it is important that the GM conceptualization proposed reflects the possibility that some failures at low-levels can affect high-level goals. This could be implemented by dynamically managing abstraction levels via the generation and elimination of goals during the running of a game session. Empirical data could be used to identify how variation in interaction causes deviation from pre-planned plot lines, and where these operate with respect to a hierarchical plan.

3.3 The flow of Game-Mastering

Tychsen [27] described RPGs as cyclic, feedback-dependant information systems in an attempt to model the overall process of information flow. While the model is useful for describing the game process at

run-time, it was not concerned with capturing the narrative fluidity of Pen-and-Paper RPGs, which similarly cannot be represented within a rigid hierarchical expansion.

Fluidity is often the human attribute that is the hardest to capture in any field, and it is likely that representing the narrative flow that a GM facilitates will require the separation of RPG activity into game management and game execution. These impact each other and their interplay should be represented in detail in both the GM and character models. This is similar to AI planning where, in this particular case, plan generation would be part of the GM role with plan execution represented by the character's activity.

1	Monitor execution and mark last dispatched action succeeded or failed
2	Re-organize goals: create new ones, abandon ones that cannot be met, decide relative importance
3	Plan next cycle: extend one of partial plans in the current set of active plans
4	Execute an action: dispatch a primitive action in one of the plans if there is one

Table 2. Continuous planning processes

On the other hand, it would seem that GMs manage the unfolding game story on many different levels and aiming to represent it as a single process within the set of GM activities would tend towards oversimplification. While player interaction at run-time is a separate concern, the interplay between the story management and player-GM interaction [27] can be subtle and can be thought of within the framework of continuous planning (Table 2) [22].

Where GM activity differs from the classic continuous planning approach is that many of the actions in its plans are not directly dispatched. The GM instead relies on the players to execute these autonomously. The GM must therefore maintain models of characters' activities both actual and probable to project specific actions to be carried out in the context of the story. While this is not the traditional style of planning, some work has considered it [15]. The complexity of predicting character actions depends on how detailed a story needs to be and how densely the GM maintains commitments to specific events happening and specific states of the story-world.

The issue of commitment is another divergence from the usual approach to continuous planning. It seems probable that GMs maintain variable amounts of commitment to actions in their plans, with the way-points already mentioned representing islands of high commitment, and other sections of plan being much more open to modification by player interaction.

It is interesting to make comparisons between the role of a GM and that of a facilitator in educational role-play. One can argue that in fact here is little generic difference, and specific differences will relate to the rationale for specific commitments to specific way-points and to the particular goals held for the role-play experience.

4 Two implementations

While the work discussed in the previous section is still conceptual, two pieces of research work have implemented ideas related to the GM concept introduced in this paper. These consist of the *FearNot!* Story Facilitator [10] and the *Double Appraisal* Story Facilitator [18]. These implementations are deeply rooted in the cognitive and affective modelling and strongly related to research in both AI and the interactive storytelling domains. They are both

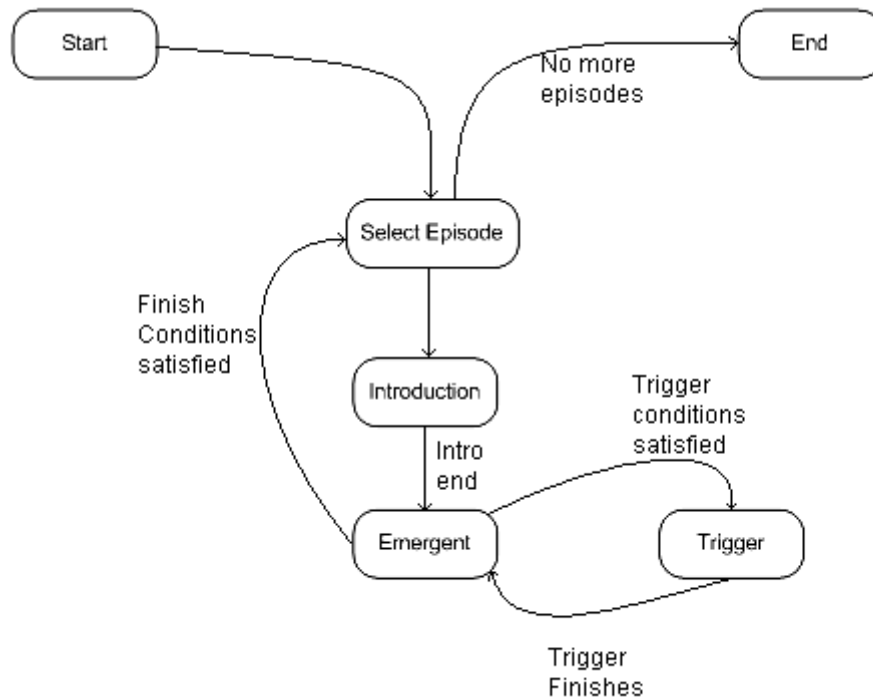


Figure 1. FearNot! Story Facilitator state machine

oriented towards a character-based representation of narratives and their conception has been heavily influenced by RPG and GM practices.

4.1 The FearNot! Story Facilitator

The story facilitator is an agent whose task is to sequence episodes within an emergent narrative structure [17] in the *FearNot!* software [23]. This application addresses anti-bullying strategies via the use of empathic synthetic characters that create virtual drama scenes through their autonomous interaction. In terms of story generation, FearNot! differs from more conventional approaches as stories emerge from the interactions between agents and users, thus generating emergent narrative. The story creation approach in FearNot! shares similarities with the GM activity in the sense that in RPGs, stories also emerge from the interactions between players and GM.

The story facilitator, implemented as an agent within a multi-agent system, is responsible for managing the unfolding of a story. It receives and monitors, through the FAtiMA [8] agent architecture, all the messages exchanged between agents and the agent framework as well as all the messages generated within the framework back to the agents. This allows the story facilitator to make decisions based on the actions the agents intend to execute. Thus, the story facilitator has the ability to know everything that happens in the virtual environment. This is coupled with the ability to perform *narrative actions* that affect the environment initiated by pre-defined triggers relating to the occurrence of specific states. These actions are primarily dedicated to story management and are limited in its present version to the selection and set up of episodes, including decisions concerning stage, characters, action repertoires and episode types. This approach is related at a high-level to some of the activities of the GM. The system behavior when supervised by the Story Facilitator can be represented as a state machine, as shown in Figure 1.

Episodes have been given the attributes seen in Table 3. When the story facilitator is in the episode selection state of Figure 1, one episode is selected from the group of episodes that have their preconditions satisfied. After the selection of the episode, its introduction (set up) is executed within the graphical environment. This introduction is composed of narrative actions and typically includes actions such as narrating an introductory text or inserting the characters on the set.

After the introduction, the next state in Figure 1 is the emergent state where the goals of the characters dictate the unfolding of the story. When in this state the story facilitator tests for any trigger eligible to be

fired. If there are triggers that can be fired, the trigger that has the higher priority as defined by the author is selected for execution.

Attribute	Description
Name	A unique name for the episode
Set	The set is the location in the virtual environment where the events of this episode will take place.
Characters	The characters of the story, defined through a set of properties like their name, position on the set, etc
Preconditions	A set of conditions that specify when is the episode eligible for selection.
Goals	Character goals that are communicated to the agents in this particular episode.
Triggers	A condition that when satisfied will cause the execution of a set of narrative actions.
Finish Conditions	A set of conditions similar to the preconditions that when satisfied indicate that the episode is finished.
Introduction	A set of narrative actions introducing the episode

Table 3 Attributes of an episode

The trigger state is similar to the introduction state, in that when the system is in this state, a set of narrative actions is executed in order, and when they finish, the story facilitator goes back to the emergent state.

An episode ends when its “ending conditions” are satisfied and the system goes back to the episode selection state. If there are no more episodes, the story finishes. In the case of *FearNot!*, there is no user interaction within episodes, however given that characters are acting autonomously, the story facilitator still has to cope with unpredictable interactions. In principle then, the same mechanism could be applied to the actions of an interacting user-driven character. The role played by the story facilitator can be thought of as a simplified version of Weyhrauch [31] in which triggers allow it to execute a sequence of narrative actions. These triggers are explicitly authored and in this version of the story facilitator there is no evaluation function allowing it to vary the sequence executed as the result of a specific trigger. It currently holds no larger-scale story-related structure, and the

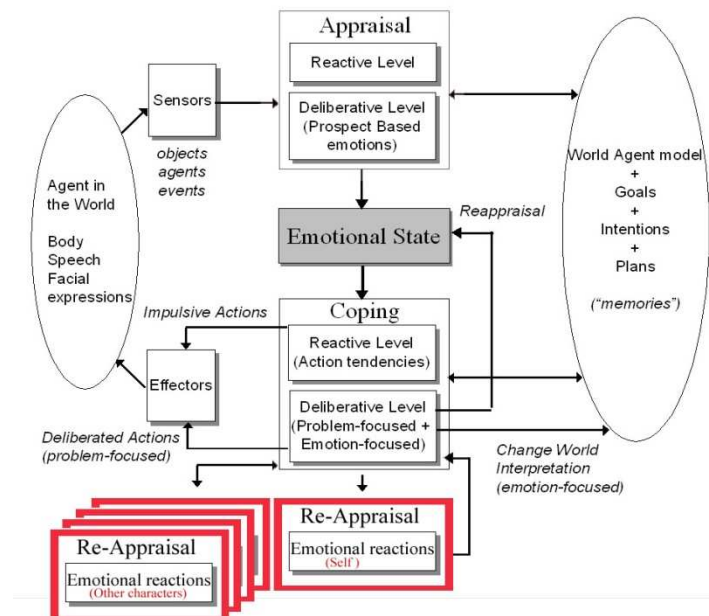


Figure 2. The FATiMA agent architecture

concept of plot-points or way-points are implicitly rather than explicitly represented in the design of specific triggers.

4.2 The double appraisal Story Facilitator

The double appraisal story facilitator is also based on the FATiMA agent architecture. It aims at managing an emergent narrative in a distributed manner so that the story facilitator itself is supported by characters that take the dramatic impact of their actions into account. By so doing, characters take on some of the responsibility for shaping the narrative and producing a dramatically interesting experience for user-driven characters. The approach taken exploits the hypothesis that the emotional impact (EI) of an action is related to its dramatic impact, and may be used as a substitute for dramatic value. It allows the characters to conjointly assume in a distributive manner the dramatic weight of an unfolding story without relying on a plot structure. Characters do not select actions solely based on their motivations and goals, but also on the emotional impact of this action either on themselves or on other characters in the scenario. The concept develops a novel agent action-selection mechanism featuring a double appraisal cycle, as opposed to the single appraisal system featured in other cognitive appraisal-based agent architectures. The agent appraises events as in any conventional appraisal-based system and generates emotions within the agent mind, but also runs another appraisal cycle in parallel. In this second appraisal cycle, the set of possible actions from the first appraisal cycle is assessed as if they were events according to the potential emotional impact of each action. Rather than selecting the action with the highest value for the character state after appraisal, the one with the highest emotional impact is chosen. The character can reuse its own appraisal system for this, with an outcome equivalent to ‘how would I feel if the action I am considering happened to me?’

The story facilitator is now given the same double appraisal apparatus as characters, with the significant difference that the actions it evaluates are actually narrative actions. As before, narrative actions include setting initial goal sets for characters, the distribution of objects in the environment, and also the outcome of physical actions which are otherwise indeterminate. Examples of this last set of actions include whether a character falls if it is pushed and whether a character is killed, wounded or the bullet misses if it is shot. The story facilitator will consider the emotional impact of such an event upon the characters before it selects it. It treats a user-directed character in the same way as all other characters, and indeed this adheres to a basic concept underlying the emergent narrative approach that if all characters have an engaging narrative experience, then the user-directed ones will too.

The advantage of this approach over the one taken in FATiMA is that story facilitator actions are now contextualised rather than entirely pre-scripted. The same narrative action may have different emotional impacts in different contexts, and the use of the appraisal mechanism means that this contextual effect is taken into account.

One of the main features of the GM in managing stories in RPGs is the ability to assess the players’ interests and apply corrective measures in order to shape the story experience of players via involvement and engagement. While this is a particularly difficult ability to model, the double appraisal features a modified action-selection mechanism in which the agent makes decisions with respect to the dramatic impact of actions (i.e. Emotional impact). The consideration of emotional impact (EI) and emotion intensity within the double appraisal concept could be regarded as a means to shape a character’s experience. It offers a novel evaluation function for the story facilitator different from that of Weyhrauch [31]. It embodies the philosophy that the detail of what happens in an interactive story is less important than its impact on the participating characters, an approach consistent with the flexibility of GMs discussed above.

The double appraisal process is implemented by examining the emotions associated with specific character goals, and both the EI an action would have if directed towards the character and towards all the agents present in a scenario. The agent assesses how a potential action would be perceived by others in order to make a choice between competing potential actions. Since goals are evaluated in FATiMA through actions, this modification also impacts the goal management of the agent. In order not to affect the actual emotional state of the agent, this re-appraisal cycle is executed in parallel to the “appraisal-coping” cycle seen in Figure 2 and takes place within a second instance of the agent’s mind that is not

connected with the agent's running emotional state. This process aims to select the action that would have the highest overall emotional impact on any character present within the scenario. It considers the impact of actions on each character and picks the one that scores the highest value for some character in the scene. The process of re-appraisal in the agent mind is shown at the foot of Figure 2.

The EI consists of the difference in intensity for each emotion represented in a character before and after an action is considered for selection. The emotion intensity is a variable that fluctuates depending on the agent's personality and current state of mind, the actions already carried out in a scenario and the time elapsed since an emotion has been generated. Thus for an action such as hitting another agent, an agent would assess the EI based on how it or others would react emotionally to being hit by another agent. The double appraisal reappraises a set of valid and eligible elements selected by the first appraisal cycle with regard to the potential EI if the action or emotion was directed towards itself and all of the other agents present in a scenario. An intention is re-appraised based on the plan to achieve it. Here the action re-appraised as an imagined event is the one that satisfies the relevant goal via its post-condition definition.

5 Conclusions and future work

This paper has discussed the specific issues relating to the management of an emergent narrative system. Given that there is no longer a unique, pre-determined plot, the methods applied in other story managers, designed to defend such a plot against the variability introduced by interactive freedom, seem inappropriate. This is far from saying that no shaping of the emergent narrative is required for the user to have an interesting and engaging narrative experience. The role of the GM in pen-and-paper RPG and in LARP has been investigated because these are seen as genres in which narrative structure and interactive freedom are often successfully reconciled. As section 3 indicates, this role is a complex one and modelling it is still in its early stages, though hierarchical planning with varying degrees of commitment and way-points seems a promising modelling approach. It would be interesting to perform a comparable study on the work of an educational role-play facilitator in order to establish how far this overlaps with the GM approaches captured so far.

The two story facilitator implementations discussed in section 4 share with GMs an ability to allow the characters to generate narrative through their interaction. The first embodies the idea of way-points or plot-points in the concept of triggers for narrative actions, which are a small subset of those a GM might employ. The second, double appraisal story facilitator, takes emotional impact as a surrogate for dramatic intensity and evaluates its possible interventions in relation to their EI. GMs also take account of the engagement of players in negotiating their component of the shared authorial control referred to above. Neither story facilitator could be said as yet to model in any substantial way the complexity of GMs. This gives plenty of scope for further work in modelling GMs in greater depth and using such a model as a guide to more complex and functional implementations. Two directions seem initially promising on the implementation side.

The first of these is to equip the story facilitator with a continuous hierarchical planner. This would differ from the approach of Riedl et al [25] in that plans would have a hypothetical character, especially at lower levels of abstraction, where they would be used to monitor character activity in relation to sections of high commitment, or way-points, in the plan. The GM might be equipped with a specific set of repair mechanisms that would form the core of its actual action repertoire. The rest of its action repertoire would be composed of actions to be invoked in specific situations as is the case for GMs who must for example decide the outcome of many actions that impact the story-world and the players. EI would be one factor used to evaluate the choice of action, but other factors such as degree of commitment would need to be added to this, and in the pedagogical context specifically educational metrics might be needed.

A second direction lies in the refinement of the double appraisal mechanism discussed. It currently reappraises both reactive actions and plans in isolation from what has gone before. The mechanism could however be extended to take emotional trajectories into account through maintaining an EI history. There seems scope here for allowing the story facilitator to apply ideas such as a dramatic climax in its choice of

actions. Combining this with the first idea of maintaining a hierarchical plan with variable commitment would allow narrative shaping a little more in the flexible style of the GM.

In conclusion, the concept of emergent narrative should not be seen as one in which characters are thrown together in the hope that narrative experience will emerge. RPGs in both pen-and-paper and LARP variants indicate that reconciling the creative powers of interaction and the structural imperatives of the author are feasible provided plot is seen as a guide to what actually happens rather than a strait-jacket to be imposed upon participants. The more sophisticated relationships between planning and execution developed in robotics form an interesting source of ideas also. The RPG genre seems a much more appropriate source of ideas for interactive narrative systems than film, with its extremely strong authorial control and focus on presenting a single story to a spectating audience. We expect that empirically-based models of the GM will be indispensable to applying new ideas to interactive narrative systems.

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Dramatic Level Analysis for Interactive Narrative

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Abstract

In interactive 3D narratives, a user's narrative emerges through interactions with the system and embodied agencies (characters) mediated through the 3D environment. We present a methodology that identifies and measures four factors in interactive narrative where agency is present. We describe a technique for measuring drama, agency and engagement and compare the centrality of a designed interactive narrative with the emergent participatory narrative. This methodology has application as an analytic device for any interactive narrative where agency is fundamental. The adoption of the FrameNet semantic resource and the interpretation of interaction in narrative, situate this work in the domain of 3D interactive narratives, mixed and augmented realities and polymorphic narratives that cross forms of media.

1 Introduction

One of the reasons that narrative is difficult in 3D environments is the seemingly inherent contradiction between authorship and participation coined the *narrative paradox* by (Louchart & Aylett, 2004). A participant in a 3D environment invariably has far more agency that manifests as control over character actions, than is possible in other mediums such as film or literature. Although the reader of a novel is far from passive, he or she cannot alter the course of events prescribed. In contrast, participants in 3D environments can readily perform interactions that often do not advance the narrative, are loosely connected or even disruptive to the narrative flow.

Although drama is accepted as intimately associated with narrative, prevailing dramatic theories regard drama to be an abstraction emanating from an entire narrative sequence. For Aristotle, (c. 335 BC) drama is a type of narrative that contains structural elements such as plot, theme, character, dialogue, rhythm and spectacle. For instance, the plot is the overarching structured narrative as having a beginning, middle and end, containing the concern or matter in question, demonstrating a dramatic peak, reversals of fortune and the resolution or catharsis of the concern. Dramatic theorists (Freytag, 1863), (Mateas, 2000), (Hiltunen, 2002) expand upon the Aristotelian view though still associate drama with the entire narrative. Figure 1a represents the perspective that parts of the narrative such as the Hero's Journey by (Campbell, 1993) (N in Figure 1a) combines with dramatic structure (DS) to lead to engagement (E).

An alternate perspective, illustrated in Figure 1b regards engagement to be due to the drama inherent at each moment (DM) in addition to the capacity for user agency (A). The influence of the authored narrative on engagement is reduced (dotted line in Figure 1b). This view that the dramatic value at each moment is influential is consistent with the double appraisal affective approach advanced by (Louchart & Aylett, 2007). Test audiences rated stories as more dramatic when agents were driven by assessments of their own, and other character's emotional states at each event throughout a sequence.

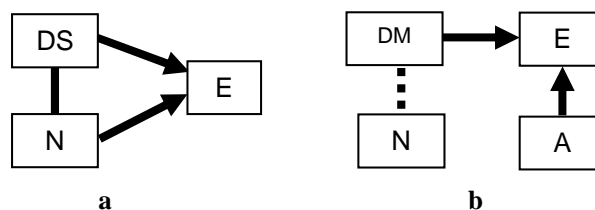


Figure 1: Dramatic Structure to Dramatic Moments

Viewing drama as manifesting at each moment enables the identification of a level of drama ranging from non-dramatic to extremely dramatic, as a factor for each event in a sequence. The compelling element that defines an event for the purposes of dramatic assessment is taken to be an *interaction*. A linguistic approach is taken to define interactions or ‘acts of doing’ by verbs. This approach to 3D interactivity has been introduced by (Crawford, 2005) who defined sets of verbs as actions that 3D game characters can execute.

The interpretation of single verbs used as labels for interaction sequences can be quite subjective. Ideally, a semantic resource for interaction should be found that relates interactions to others in agreed upon ways to constrain the subjectivity and introduce a degree of standardization. A linguistic framework, the Berkeley FrameNet Project (2006) that performs the role does exist. This is an on-line lexical resource for English based on frame semantics. The project and its application to this study as a semantic resource for interactions is described further in Section 4 where we describe *Dramatic Value*.

Since most people are drawn into the drama of narrative or stories, it is reasonable to expect that most people will agree on the level of drama inherent in a single interaction. An *attack* interaction will be universally regarded by most people to be highly dramatic. A *sleep* interaction will be largely thought to be quite undramatic. Drama is not as directly connected to the narrative as dramatic theorists would claim but derives perhaps more directly by association with moments in the human experience. This is not to claim that the specific context of an interaction has no impact on its dramatic level; a *sleep* while perched precariously at height can be imagined to be highly dramatic. Rather, a level of drama can be conceivably associated by default with each type of interaction.

The hypothesis that most people agree about the dramatic level inherent in a particular interaction has not previously been studied. Results from a study using an online survey confirm this hypothesis and are presented in Section 5.

A dramatic flow for an entire narrative sequence can be generated by plotting the dramatic level for each interaction throughout a sequence. Conversely, tracing an existing narrative created from a user’s interaction with a narrative 3D environment (participatory narrative), can be analysed with regard to the level of drama for each user interaction. This generates a framework from which factors such as the level of the user engagement and the centrality of the authored narrative can be measured.

In this paper we describe agency as reducing the centrality of the structured drama. This does not mean the structured drama is less important. Put simply, narrative becomes *meta-narrative*. It is less important for the dramatic moment since agency replaces this, but none-the-less crucial for the narrative experience. We advance a new approach that identifies engagement as a derivation of narrative and drama somewhat independently. The measure of the dramatic level, the measure of agency and the centrality of the designed narrative of each sequential interaction can therefore describe a 3D experience. We call this the Interactive Narrative Framework. Interaction and engagement are central concepts and are discussed in Sections 2 and 3. Following that, dramatic level is presented along with a survey that indicates some universality in perception of dramatic level for sample interactions. The use of the Interactive Narrative Framework for the analysis of user experience with a 3D environment is presented in Section 6 prior to concluding remarks.

2 Interaction

(Calleja, 2007) describes interaction in 3D games as the user’s ‘acts of doing’. These acts of doing according to (Bjork & Holopainen, 2005) are *Freedom of Choice* and *Illusion of Influence* patterns. They either validate, or give an illusion, that the user’s acts have some meaning or effect on the progression or conclusion of a 3D narrative.

The methodological framework we present emphasizes interaction as the means to measure and structure the drama and facilitate the identification of user patterns of engagement. Each interaction is tagged with a numerical value representing its level of drama; this value can be used as a comparison point for other

factors such as the user's engagement in the narrative or the user's level of agency. For example, an *Ambush* interaction is quite dramatic and is tagged with a high dramatic value; an *Attach* interaction is not dramatic, but may involve a dramatic agent *Murderer* or a non-dramatic object *Paper*.

Interaction is not simple. (Jensen, 2001) describes it as so complex that its meaning depends on the context, but (Elam, 2006) writes that interaction involves two or more entities; *agency* and an *affected entity* that may, or may not have agency. The 'acts of doing', or actions of the agent are crucial structuring principles that involve some intention or purpose. Indeed, in the framework we present, the agent of an interaction is both cognitive and has agency (is agentative) since it is typically the User who makes decisions that are enacted by the Avatar. Acts of doing or interactions are conceptualized by a set of defining constraints that link to the affected entity that may be a simple object without agency or cognition, or cognitive and/or agentative.

Fight for example, is a *compound* interaction and more complex than a *basic* interaction that (Elam, 2006) describes as a 'mere doing' that might be the simple raising of an arm or taking a step forward. Basic interactions combine to form a *compound* or *higher order* interaction, such as participating in a fight or powering up a magic spell. The basic interactions contained within a compound interaction can be significant to the narrative alone but more typically when grouped in a meaningful way as in a compound interaction.

The two constructs we have identified as crucial for understanding interaction and 3D narratives are *engagement*, the level of user involvement in an interactive narrative, and *agency*, the means by which a user is able to interact. Engagement and agency are discussed in the next section.

3 Engagement

From a dramatic perspective as (Mateas, 2000) writes, agency is the most fundamental category in interactive narrative and engagement implicit in the Aristotelian dramatic model, since engagement is necessary for an audience to experience catharsis. The resolution of the concern, complication or matter in question can only occur if the user is already connected or engaged in the concern or matter in question. If the designed narrative does not engage the user, then its conclusion is unlikely to feature in the formulation of the participatory narrative, or the *story* of the user experience of the designed narrative. Mateas adds that agency is central for user engagement in interactive narratives, and the disruption of agency disrupts engagement. Furthermore, the degree of agency affects the degree of engagement. In a *Cut Scene* for example, where a short video describes some aspect of the designed narrative, the user has no agency, and engagement is typically lost. In Calleja's (2007), study, only 2 participants stated they gave any importance to prestructured narrative. The majority of participants skip quest descriptions to get to the interactive functionality where some level of agency is possible.

Agency fosters the feeling of engagement that comes from being able to take some action, or interact in the 3D world with an effect that in some way relates to the user's intention or will. At the very least, according to (Bjork & Holopainen, 2005), the effect of an interaction must give the *illusion* of affecting the narrative for it to be engaging.

It is unlikely that users will engage in any given designed or pre-authored 3D narrative in its entirety since, if they cannot exercise some form of agency or make decisions that affect the drama and direction of their own narrative experience - quite simply, they will stop participating.

The analytic methodology we present facilitates the *measure* of a participant's engagement, the levels of agency and drama in an interaction and the impact of the designed narrative through the Interaction Framework we describe in this paper. Since interactivity is core to involvement and engagement, and agency is embedded in a user's acts of doing, it is feasible to plot the course of a participant's narrative, interaction by interaction. This generates a structured framework from which the dramatic signature or flow of drama within any sequence of interactions can be drawn. When applied to a scenario or a meaningful collection of interactions, factors such as the dramatic signature for type, or pattern of

interactive narrative parts, indeed for an entire interactive narrative is unveiled. From this, it is possible to log a participant's level of involvement or engagement across any game element type and narrative pattern.

4 Dramatic Value

The segmentation of actions into units, as (Damiano, Lombardo, & Pizzo, 2005) write is a well known convention that dates back at least as far as Aristotle, (c. 335 BC) and has been formalized in semiotic studies such as (Elam, 2006), in order to mark the discrete progression of the narrative.

Although the dramatic flow arc is well documented by most authors that discuss drama, other than (Damiano et al., 2005), it is difficult to find any work that defines a dramatic level or variable for computing the level of drama at a given point in an interactive narrative.

In this study we use tripartite compound interactions; (a) the agent noun, (b) the interaction verb and (c) the affected noun(s). Designating the user as agent, enables the tracing of the users interactive experience even when the users' acts of doing are not those proscribed within the narrative design. From a single perspective followed through the parts of an interactive narrative, data such as the level of user agency, engagement and drama, as well as the degree to which the designed narrative has impact on the moments of doing, can be assessed.

The formalization of compound interactions using the method we advance requires both *verb* and *noun* thinking. For example the interactions *repel wolf* or *modify avatar* are comprised of a verb and a noun, and enacted by the user. All verbs and nouns in essence have some level of drama, even if this level is zero.

Preliminary results from a study using an online survey seem to confirm the hypothesis that most people agree about how dramatic a particular verb, phrase or noun is. In the study, participants were asked to indicate the dramatic value on a scale from 0 - 3 associated with a set of verbs, phrases and nouns. Value 0 indicates a *Not dramatic* response. The remaining values 1, 2, 3 respectively indicate increasing levels of drama; *A bit dramatic*, *Dramatic* and *Very dramatic*.

5 Dramatic Value Survey

The anonymous online survey was constructed (Macfadyen, Stranieri, & Yearwood, 2007), with 88 respondents drawn from a cross section of University staff and students. The results indicate that respondents *do* agree on the level of drama of a given word or phrase.

Each respondent was presented with 38 single word nouns such as *the air*, *the death*, *the lute*, *the quest*, *the viper*, *the train* and 39 single word verbs such as *to perceive*, *to reveal*, *to struggle*, and *to devour*. Respondents were also presented with 20 phrases including *He looked back*, *He is dragged into the blood-stained room*, *She attempts to conceal herself but is discovered*, *All who hear him sing are entranced*, *On her wedding day she is slain by a viper*. The verbs, nouns and phrases were randomly drawn from texts of sample myths.

Of the 8,439 responses within the pilot group, a significant level of agreement (as determined with a Chi Squared test with $p < 0.001$) about the level of drama on the four point scale for verbs, phrases and nouns was noted for all but two variables. From 39 verb variables tested, only two variables *To Love* and *To Marry* did not indicate a significant level of agreement about level of drama (Chi statistic (Love) = X, $p > 0.05$; Chi statistic (Marry) = X, $p > 0.05$). Of 20 phrase variables and 38 noun variables, all results indicated significant agreement, and no variable was unproved. More data is needed to determine differences, if any, in both gender and proficiency with the English language.

The advantages of calculating a level of drama at any plotted interaction point, is that in a given narrative or scenario, any single chosen point of view can be measured against it and the dramatic arc flow signature for any scenario is revealed. For interactive 3D narratives, this is crucial, since the user's

narrative experience frequently does not match the designed or authored narrative expectations, and further, must include user/system interactions that are usually omitted in the design plan of interactive 3D narratives.

It is important to make the distinction between a thing that is essentially dramatic, like the verb *To Menace*, and the *dramatization* of a thing that, for example is essentially undramatic such as the noun *Sparrow*. The verb *To Menace* is very dramatic and cannot be made less dramatic. The overall dramatic level of a compound interaction where a *Menacing* act occurs can be modified to be *more dramatic but not less* by the inclusion of objects (nouns) that alter the dramatic sum for the interaction.

The dramatic sum for an interaction is the total of the dramatic values for the agent/noun, interaction/verb and object/noun.

Table 1: Dramatic Values

User/Agent	Verb	Value	Noun	Value	Total
User	menaces	3	a sparrow	0	3
User	speaks to	0	the Cyclops	3	3
User	speaks to	0	the shepherds	1	1
User	menaces	3	the shepherds	1	4

Table 1 illustrates how the User who menaces the shepherds has a greater dramatic sum than speaking to the Cyclops. The *Shepherds* and the *Cyclops* have dramatic values of 3, but *menacing* is more dramatic than *speaking*.

6 Interaction analysis

The user in a 3D environment experiences three types of interactions; those between non-player characters and elements within the 3D environment, those between the user's avatar and 3D environment elements and those between the user and the computer system. If engagement in interactive 3D environments does not derive from the narrative, it may derive from the dramatic flow of the three types of interactions the user experiences when engaged in a 3D environment.

The task of measuring user engagement at each dramatic point is challenging, however the preliminary analyses reveal clear patterns of engagement and disengagement in relation to the types of narrative and interactive structures in the sample single user computer game *The Elder Scrolls IV - Oblivion* (Bethesda Softworks, 2006). Using the Interactive Narrative Framework (IFN) advanced here, as an analytic tool, we are able to define an orthogonal perspective shown in Figure 2 that suggests that strong dramatic levels combined with strong engagement are usually associated with (a) user/system interaction and (b) dramatic peaks such as the reversal of fortunes within the interactive narrative. Additionally, strong engagement does occur where low dramatic levels are plotted within a dramatic arc, but decreases where there is little or no interactivity.

Figure 2 shows results from an analysis of a user's progress in the Role Playing Game (RPG) *Oblivion* (Bethesda Softworks, 2006). Results were calculated using the IFN to plot the level of drama and agency at each interaction combined with the user's self-reporting of the level of engagement at each interaction.

7 Conclusion

The claim advanced in this paper is that the inherent contradiction between authorship and participation often advanced as deleterious to 3D narrative occurs largely because of how narrative is conceptualized. In contrast to prevailing dramatic theories that view drama as an abstraction emanating from an entire narrative sequence, we view drama as a feature of the interaction between player and 3D environment at

each event throughout a narrative sequence. A methodology is presented that provides a technique for measuring drama, agency and engagement and compare the centrality of a designed interactive narrative with the emergent participatory narrative. Empirical results illustrate that a level of drama is clearly associated with an interaction expressed as a phrase. The adoption of the FrameNet semantic resource adds a degree of standardization and universality. The approach is presented as useful for analyzing engagement in 3D environments.

High Drama / High Engagement		
	Type	Interaction
1	Cross media	<i>User Discover</i>
2	User/System	<i>Victory</i>
3	User/System	<i>User Steals M Spells</i>
4	User/System	<i>User Cheats System</i>
5	User/System	<i>User Steals Gold</i>
6	Game Play	<i>User energizes M Spell</i>
7	Game Play	<i>User energizes M Spell</i>
8	Game Play	<i>Dog/Wolf attacks User</i>
9	Game Play	<i>User Hurls M Spell</i>
10	Game Play	<i>M Spell Tames Wolf/Dog</i>

Low Drama / Low Engagement		
	Type	Interaction
1	Cut Scene	<i>Display Cut Scene</i>
2	Cut Scene	<i>User Scans Cut Scene</i>
3	Cross media	<i>User Uses Internet</i>
4	Cross media	<i>User Resumes Game</i>
5	Game Play	<i>User Walks</i>
6	Game Play	<i>User Follows Compass</i>

High Drama / Low Engagement		
	Type	Interaction
1	Cut Scene	<i>System Frustrates User</i>
2	Cut Scene	<i>User Capitulates</i>

Low Drama / High Engagement		
	Type	Interaction
1	Creative Control	<i>User Creates Avatar</i>
2	Creative Control	<i>User chooses avatar features</i>
3	Creative Control	<i>User Ends Avatar Session</i>

Figure 2: Orthogonal analysis

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A Game Creation Tool which Supports the Development of Writing Skills: Interface Design Considerations

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Abstract

Improving children's writing skills is a significant concern in schools. A key problem identified is a lack of engagement and motivation with writing tasks. Computer game creation has potential as an activity for improving writing skills. It can be very motivating, and offers an excellent opportunity for developing writing skills within a media-rich context. We argue that whilst existing game creation tools make the activity possible for school-aged children, they fall short of supporting writing skills development because the interfaces focus attention on non-literary aspects of game creation. This paper describes some key issues to be considered in designing an interface which will provide targeted support for the development of writing skills through game creation. We propose design considerations drawn up through consultation with teachers, and with reference to curriculum documents and external representations literature. These guidelines will be used to inform design-based research which will take a learner-centred design approach to building the interface, allowing a number of key issues to be investigated.

1 Introduction

Concerns about the need to improve school children's writing skills have grown in recent years (Fisher et al., 2002, Goodwyn, 2002). One problem that has been identified is children's lack of motivation for tackling writing tasks (Younger et al., 2005), as well as feelings of apprehension about writing (Mulholland and Robertson, 2001). Computer game creation can be a very motivating activity, and it is notable for being motivating whilst also involving a high level of challenge and hard work (Good and Robertson, 2006). Game creation has potential as a new way of developing writing skills which can excite and engage children and recognise and support the changing nature of literacy.

Existing work has investigated game creation as an activity which can help develop narrative and storytelling skills (Good and Robertson, 2006, Robertson and Good, 2005b, Robertson and Good, 2006, Szafron et al., 2005). These investigations have used game creation tools which are revolutionary in allowing children to create simple 3D games without the need for specialist technical skills. A key focus in studies using existing tools has been the potential for game creation to allow young people to create complex narratives without needing to be proficient in more traditional literacy skills (Robertson and Good, 2005b, Robertson and Good, 2006, Szafron et al., 2005). This opportunity for young people to engage with a new form of digital literacy without being held back by literary problems is invaluable, but there is also potential for more general and transferable writing skills to be developed. We believe that with an appropriately designed interface, the activity could support the development of these more traditional and often lower-level skills such as using descriptive language effectively, in addition to higher-level writing skills such as reflection and creating complex narrative structures.

The target group identified as an initial focus for this undertaking is 11-14 year olds; Key Stage 3 (KS3) in England, Wales and Northern Ireland and Primary 7 (P7) to Secondary 2 (S2) in Scotland. These pupils will be old enough to benefit most from game creation, and a drop in motivation levels in English has been observed at KS3 (Goodwyn, 2002) so there is a lot to gain. There are a number of tools available which allow children of this age to create games and other types of digital stories (Begel and Klopfer, 2007, Kelleher and Pausch, 2006, Robertson and Good, 2005a, Szafron et al., 2005), but at present these interfaces tend to focus attention on non-literary aspects of games such as level design, character appearance and combat related settings.

The following section explains how game creation has the potential to encourage the development of writing skills, and argues that existing tools do not currently provide enough support to fully achieve this potential. We then outline an initial set of skills which have been identified in consultation with teachers as being appropriate for development through game creation. A number of design considerations are then proposed, with reference to skills identified, teacher input and external representations literature. Finally we describe how these considerations will contribute to the overall design process of a new interface.

2 Developing Writing Skills through Game Creation

Commercial video and computer games are often written by large teams and will customarily employ at least one dedicated writer for the project. Although some games succeed without particularly compelling narratives, the plot is generally considered to be an important part of most games. Some believe that games are an important new medium for storytelling (Atkins, 2003, Laurel, 2001), but it is not necessary to agree with this to recognise that writing skills are involved in creating most games. Game design handbooks indicate that creating an engaging interactive story within a game environment involves creating realistic characters, developing interesting plotlines and writing compelling dialogues (Bateman, 2007, Handler Miller, 2004, Ince, 2007). These are skills that are also used in a wide range of creative writing activities.

Robertson and Good have been investigating the potential for game creation to support interactive storytelling, among other learning activities, for a number of years (see for example Good and Robertson, 2003, Good and Robertson, 2006, Robertson and Good, 2004, Robertson and Good, 2005b). They have carried out an extensive series of studies using a game creation toolset distributed with *Neverwinter Nights* (NWN) (BioWare, 2002), a 3D role-playing game. This tool was chosen because it allows young people without specialist technical skills to create games with commercial quality 3D graphics. Children can use the toolset's Graphical User Interface (GUI) to quickly create areas, objects and characters by dragging and dropping GUI elements. Wizards and menus allow the user to set up events to take place within the game, including interactive conversations between the player and a non-player character (NPC). Using these tools, children are able to create simple games quickly and easily. Results from these studies have indicated that it is possible for children to use these tools to create games with elaborate plots, interesting characters, compelling narratives, and sophisticated themes, with many participants writing extensive dialogue for their characters.

Game creation can provide a creative outlet for young people who have difficulty expressing themselves in more traditional creative writing tasks (Robertson and Good, 2005b). Strong motivation for children to create an interesting and enjoyable interactive story comes with the knowledge that their game may be played by their peers. Additionally, game creation is very supportive of reflection and revision as the build-play-revise cycle occurs very naturally with this activity (Good and Robertson, 2006). Furthermore, receiving and taking into account feedback from peers can help children to develop audience awareness skills (Good and Robertson, 2006). The NWN toolset has also been used by a team at University of Alberta in storytelling workshops with high-school students. They noted that students found it very motivating to create interactive stories with the toolset, and observed high levels of collaboration and spontaneous peer evaluation occurring (Szafron et al., 2005).

However, there are problems with using commercial tools such as the NWN toolset. Firstly, creating complex narratives can require the use of a scripting language. This requires programming skills which most children do not have, and distracts attention from higher-level story writing tasks. There have been a number of attempts to provide an alternative to using a scripting language (Szafron, Carbonaro et al. 2005; Howland, Good et al. 2006). However, there is a more serious problem with repurposing a commercial tool such as the NWN toolset, which underlies the scripting issue. The tool was created for a specific purpose; allowing gamers who have played and enjoyed the original NWN game to build their own adventures of the same ilk. It provides excellent support for building attractive 3D areas, quickly adding multiple generic characters to the environment, and creating basic (mostly combat or quest-

related) storylines through wizards. Using the tool for interactive story writing involves a different type of target user and the task requires different interface support.

Work has begun on a purpose-built game creation tool for young people, Adventure Author (Robertson and Nicholson, 2007), which aims to support game creation as an interactive storytelling activity. An early prototype of the tool was built through a learner-centred design process (Good and Robertson, 2003). This approach is continuing as the tool is now being built as a plug-in to the Neverwinter Nights 2 (NWN2) toolset (Obsidian Entertainment, 2006). This allows the commercial quality NWN2 graphics and game engine to be used in conjunction with an interface specifically designed for supporting school-aged children in building interactive stories. So far attention on the design has focussed on supporting the creative process of interactive storytelling, with interface support for ideas generation and sharing (Robertson and Howells, In press, Robertson and Nicholson, 2007). However, attention also needs to be given to interface support for specific writing tasks if game creation is to support the development of writing skills.

3 Teacher Consultation on Writing Skills

Our aim is to provide targeted interface support for the development of key writing skills. A specific skill set will be drawn up in consultation with teachers and literacy experts with reference to the National Curriculum for England, Wales and Northern Ireland, and the Scottish Curriculum. We have begun identifying a potential skill set in consultation with two Key Stage 3 English teachers. The teachers were interviewed about their opinions on game creation as a potential activity for developing writing skills. After being introduced to the NWN toolset they suggested skills which they believed could be developed through game creation. They were also asked to identify other skills which could be developed if the tool was altered. The National Curriculum Programme of Study for Key Stage 3 English was used as a reference tool in this discussion, and concepts which are outlined in this document are italicised.

Composition Skills Both teachers felt that a variety of composition skills could be developed through the activity of game creation. In the context of writing to imagine, explore and entertain they mentioned *drawing on experience of different fictional forms in composition, using imaginative vocabulary and varied linguistic and literary techniques and exploiting choice of language and structure to achieve particular effects and appeal to the reader*. The programme of study notes that the variety of narrative structures can include sound and images as well as words.

The teachers stated that the potential for developing imaginative vocabulary and choice of language could be increased by including opportunities for using text to a greater extent in creating games. Suggestions for this included activities which are already possible in the toolset such as adding text-based introductions to scenes and creating diaries for the player to read. One teacher also suggested that actions such as creating a new character or setting could be carried out through typing in text-based descriptions rather than selecting from a visual library of potential characters or backgrounds.

In the context of writing to inform, explain and describe, areas highlighted included the ability to form sentences and paragraphs that express connections between information and ideas precisely, using formal and impersonal language and concise expression and considering what the reader (player) needs to know. In addition to the suggestions above one teacher suggested that pupils could develop their use of formal and impersonal language if they wrote in the 'voice of the game' to give instructions and information to the player. It was also observed that skills in the area of writing to persuade, argue and advise such as anticipating reader (player) reaction and using persuasive techniques and rhetorical devices could be developed through creating games.

Planning, Drafting and Reflection *Planning, drafting, redrafting and proofreading* were also highlighted by one teacher as skills which could be supported, as it was noted that the tool gave potential for changes to be made easily allowing aspects of the game to be refined regularly. A further key skill suggested was *the ability to analyse critically their own and others' writing*; something which is supported and encouraged by self and peer play-testing which occur naturally in game creation settings.

Other Writing Skills *Presentation skills*, and *using ICT* were also raised as clearly relevant by both teachers and audience awareness skills, including *being sensitive to an unknown audience* were also highlighted as having potential.

Other English Language Skills The teachers were also asked about other areas of the curriculum, closely related to writing skills, which could be developed. Both cited the *drama and speaking and listening* strands of the curriculum as being relevant. They also felt that *language variation skills* were an area that could be developed through writing interactive conversations in different styles according to the characters in question.

One teacher also suggested that the reading attainment target of *understanding the author's craft* could be developed by looking at other games and conventions in the planning stage, stating that children could 'read' other computer games. Both teachers highlighted the media and moving image area of the curriculum as very relevant and felt that lots of attainment targets in this area could be addressed through computer game creation. Understanding of *how meanings are changed when texts are adapted to different media* was also highlighted as an area which game creation could help develop.

4 External Representations in Educational Software

Educational software user interfaces have to support the user's learning as well as ensuring that interaction is straightforward and intuitive, so the choice of representations used in the interface are particularly important. It is generally accepted that a single representation is not sufficient to represent all aspects of any complex entity (Schwarz and Dreyfus, 1993), and a 3D computer game is certainly such an entity. It is clear then, that any given representation of a computer game will highlight certain aspects over others. In the NWN toolsets, information about the 3D area in which the game takes place is given this privileged position at the expense of information about the interactive plot or character traits. The match-mismatch hypothesis (Gilmore and Green, 1984) states that where a representation highlights a certain type of information, tasks using that type of information will be easier to perform than those requiring other types of information. Where required information is implicit in a representation and needs to be inferred the task will be harder than if the information was presented implicitly. If we assume that children will be drawn to tasks which are easier we might predict that children using a tool which represents the game primarily in terms of spatial aspects would be drawn to focus on working on these aspects of the game. This is backed up by self-assessment of time spent on different aspects of game creation by a group of children who used the tool over a week long workshop (Robertson and Good, 2004).

Trying to hold a mental representation in working memory over a period of time can lead to cognitive overload, something which is to be avoided in learning environments (Mayer and Moreno, 2003). At present, when trying to write an interactive story, users of the NWN and NWN2 toolsets have to keep an internal representation of the (often very complex) branching plot in their minds. This can place a huge load on the user and may understandably lead them to focus on other aspects of game creation which are better supported. If the aim is to develop composition skills such as structuring narrative to achieve particular effects and appeal to the audience, then it will be necessary to support users in building complex plots by providing a representation of narrative structure to support cognitive off-loading. This will need to be in addition to rather than instead of the existing representation, and it will be important to provide adequate support for working with the consequent multiple coordinated representations (Ainsworth, 1999).

Making a task easy to perform by providing explicit representation of the required information is beneficial. However, making a task as easy as possible should not be the aim. There are a number of tasks which the current NWN toolset interfaces make very quick and easy, including the creation of an area, and adding new characters, objects and scenery to the area. Whilst it may seem beneficial for composition related tasks such as these to be easy to carry out, easier is not always better when it comes to educational tools. When the aim is to help students to learn, having an interface which make certain tasks too easy can

work against this aim (Brna et al., 2001). For example, in the NWN toolsets the user can ‘create’ a character simply by dragging a character model title from a list into the 3D area. A new character now exists in the game world, but it is a generic character with default options chosen without any input from the user. Creating a character is an important skill in creative writing, but the toolset makes this an insignificant process. The user has no opportunity to practice developing a well-rounded character, or to reflect on the character’s motivations or back story. The task is only ‘made easy’ by hiding the complexity which the user needs to engage with if they are to develop skills in creating characters.

Norman distinguishes between experiential and reflective cognition (Norman, 1993), and expresses concern that using multimedia learning environments can encourage experiencing when one should be reflecting. Experiential or ‘reactive’ cognition does not require deep thought and is event driven with automatic reactions following from input. Reflective cognition requires much deeper thought and tends to be slower and more laborious. It also requires the ability to store temporary results and use those results in further thought processes. For this reason external representations can facilitate reflective cognition by allowing more complex chains of reasoning to be built up, providing further evidence that representational support should be given for complex composition tasks such as structuring a narrative.

Choice of representation can completely alter the mode of cognition used in a task. Being able to drag in a generic character to the game world turns a task which should require considerable reflection into a purely experiential task. This fits with findings about using direct manipulation interfaces in problem solving tools. Svendsen (1991) concluded that whilst direct manipulation interfaces can be very user-friendly they can actually hinder problem solving if they are supportive of thoughtless action. The important distinction is between selection, which is quick and easy and can be done without deep thought, and composition, which requires considerable thought and effort. Direct manipulation interfaces can be limited to selection rather than composition, as in Svendsen’s study, but this is not necessarily the case and depends entirely on the level of granularity.

The key concern for educational tools is that extensive thought should be applied to the right activities, that is, the activities which involve the practice of the skills which the tool aims to develop.

5 Interface Design Considerations

Whilst a number of the skills highlighted by teachers are already well supported in game creation there are also a number of areas in which support for other skills could be added or improved in a new interface. There follows three key interface design considerations drawn up with reference to findings from the teacher consultations and related work in external representations literature.

Concentrating Reflective Thought on the Right Activities A game creation interface which made the task of saving the game into a reflective activity which required deep thought would be unsuccessful (unless the aim was to teach about the underlying process of writing a game file to disk). Similarly a complex scripting language is an undesirable way of creating in-game events (unless the aim is to teach coding skills) (Howland et al., 2007). As our aim is to develop specific writing skills the interface should encourage deep reflective thought when it involves the practice and development of those skills, which are naturally composition-based tasks. Other aspects of game creation should be carried out easily through selection to avoid distraction and unnecessary cognitive effort.

The Importance of Text A significant piece of feedback from the initial teacher consultation suggested that writing in text should play a greater part in the game creation process. It was recognised that writing skills in the broad sense are not limited to text-based composition, but noted that being able to express ideas through text is an important skill. Writing through text is a very reflective process, which involves formulating thoughts fully, so it is certainly a good candidate for interaction which encourages reflective cognition. It would also open up a much wider range of skills which could potentially be developed through the activity.

It is absolutely crucial however, that the key benefits of game creation are not lost; the motivating nature of the activity, and the opportunity it provides for children with poor literacy skills to express themselves creatively and engage in creating complex narratives. It would be beneficial to exemplify a parallel relationship between text and audio and visual representations of writing components. There is a potential to bring out a key skill here; understanding how meanings are changed when texts are adapted to different media.

Granularity of activity It will be necessary for users to undertake some detailed and low-level composition work, to enable them to develop specific skills, but there are also a number of other skills identified which involve composition at a higher level such as structuring a piece of narrative. To avoid frustration from users at always having to build up games from a low level the tool could allow narrative 'building block' components to be built up and manipulated at a higher level. Examples of these components would include characters, conversations and scenes. These could be reified through representation, for example characters could be represented by a card which showed their image, and information about their traits and temperament. So whilst the process of creating a character could be quite lengthy, it would culminate in the creation of an entity which could be used in different scenes or even in different stories. A key benefit of these building blocks would be the potential for collaboration and sharing of resources between users, for example a user could pass on a character, conversation or scene they'd created to a friend. This would be supportive of naturally occurring sharing of ideas already observed (Good and Robertson, 2006).

This would also give the potential for different types of skills to be targeted more specifically through alternate ways of using the system. Instead of starting from scratch users could be given example building blocks by the system, and work on higher level structuring tasks such as choosing the order that scenes occur in. They could then choose at a later stage to customise and personalise the entities by going through the lower-level creation tasks.

6 Future Work

The next step for this work is requirements gathering with stakeholders including teachers, target users and a literacy specialist. This will involve finalising the skill focus and deciding additional requirements for the system through observing children working with current tools. A learner-centred design process will then begin; including design activities and low-fidelity prototyping with target users. A high-fidelity prototype will also be built and tested with users. The final tool will function as a complementary add-on to the Adventure Author tool, and will be evaluated in a school-based study. It is hoped that the evaluation will help determine whether game creation activities can support the development of Key Stage 3 pupils' writing skills. The research should also allow us to investigate how interface representations of a game under creation can affect the skills which can be developed whilst creating games, potentially contributing to the wider question of how representations in educational applications influence the development of skills. Finally, we hope to be able to determine whether the activity of game creation can be geared towards specific skills development without losing the motivational affordances of the task.

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Narrative, Meta-narrative and Susan

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Abstract

In this paper, two different concepts of narrative are considered; narrative as an encapsulation of the self or identity, and narrative as a pedagogical tool to facilitate learning. The paper then describes how they are integrated in an interactive multimedia learning environment to provide a realistic coaching skills simulation.

1 Introduction

This paper is about the challenge of creating a realistic coaching skills simulation and the critical role of narrative, both in providing realistic characters and in crafting an overall story that helps keep the learner engaged. We start by clarifying what is meant by coaching in this context, the role of narrative in learning, and narrative as the story of one's identity. An explanation of the place of narrative in coaching is followed by considering the task of writing convincing narrative and meta-narrative for a coaching simulation. The paper concludes by highlighting the challenge of designing the learner's realistic involvement in the story.

2 Coaching

Grant (2004) describes coaching as a process of facilitating enhanced performance, self-directed learning and professional and personal growth, with a solution focus and an emphasis on results. This generally means listening, giving feedback and asking questions to help the client get to where they want to be, and encouraging reflection to help the learning process. The coaching skills of listening, questioning, and familiarity with the process of coaching are usually learnt in a group workshop using role play. This is, however, costly, time consuming and very dependent on the skills of the individuals carrying out the role play. The purpose of the simulation is to provide a learning tool that can be used by a student coach, offers a consistent level of role play, will encourage learners to practice, could be used by a group, and will be less costly.

3 Narrative & Learning

According to Bruner (1986), we have two complementary but distinct modes of thought, and in his view, both are essential. One can be described as paradigmatic, and follows scientific logic and verifiable proof to establish 'the truth', while the other is narrative, which is more concerned with verisimilitude and tends to focus on human intention and action. The importance of this second mode, narrative, has been increasingly recognized as an important pedagogical tool (Plowman et al 1999, Hazel 2006).

Narrative is a key tool in understanding texts of all kinds and hence our learning in a variety of environments. If the story doesn't make sense, or is missing, then we find it hard to understand and learn. Plowman et al (1999) looked at the need for narrative in the context of multimedia interactive learning environments and found that there needed to be a balance between providing guidance through narrative, and allowing learners the opportunity to create their own narrative, an inherent part of the learning process from a constructivist view. Mott (1999) goes further and believes that learning environments should be narrative-centred. because in addition to its role in meaning making narrative transports readers,, And Hazel (2006) believes:

"Using narrative entails being personally involved with the learning materials, looking at them afresh, reinterpreting them, being excited by them, and creating new knowledge." (Hazel 2006:57)

4 Narrative and identity - Susan's story

Narrative as a strand of psychology became accepted in what Harré (1992) termed the “second cognitive revolution”, the “first cognitive revolution” being the acceptance that there are mental processes behind people’s actions. As Herman (2007) describes it, “the second cognitive revolution seeks to situate the mind in material contexts of action and interaction without however *reducing* mental to bodily activity in the way that the behaviorists did.” Herman lists five key concepts that can inform narratological research: positioning, embodiment, the distributed versus the local nature of the mind, emotional discourse, and qualia (conscious experiences having subjective properties). For example, a client may tell her coach that she is managing well generally (positioning) but feels she is not on top (metaphor-embodiment) of her work yet (positioning) and this frustrates her (emotional discourse), and she goes on to describe a particular event that demonstrates all this. The process of questioning and feedback that brought this story out demonstrates the distributed nature of the mind, and her experience of the event she described is captured for her as a qualia. We must, of course, be aware that we can choose what to reveal. Essentially the stories we tell are about our identity.

“...we organize our experience and our memory of human happenings mainly in the form of narrative-stories, excuses, myths, reasons for doing and not doing, and so on.” Bruner (1991)

Cultural differences might be rooted in the preferred stories of a particular group, such as racial, ethnic, gender, or religious or even organizational groups. This is the view expressed by Howard (1991) in a study of culture tales. He recalls an old Spanish proverb:

“Habits are at first silken threads - Then they become cables. The same could be said of stories. Thus, a paraphrase of one of Shakespeare’s more dire warnings becomes appropriate, Beware the stories you tell yourself - for you will surely be lived by them.” Howard (1991:196).

The coaching process described earlier implies that we believe that we are able to change our self in some way, and in fact research suggests that there are numerous possible selves. As Markus & Nurius (1986) point out, possible selves are cognitive components of our hopes and fears, our goals and threats. If we are dissatisfied with our self, that suggests we have preferred views of how we could be, and indeed, our self-evaluation may well have been triggered by our knowledge of other possible selves. While our identity tends to be fairly stable, our current self-concept can fluctuate from hour to hour as we adapt to our situation in a variety of tasks and relationships, but those fluctuations are generally minor when compared with the sorts of changes that coaching might bring about. Markus & Nurius (1986) suggest that the motivation of all changes, both small and considerable, is linked to our view of our possible selves.

The first part of the coaching process is to listen for assumptions, beliefs, and meanings, reflecting them back to the client for comment, elucidation and exploration. The client might be encouraged to reframe their story, seeking alternative interpretations. During the coaching conversation the new story would be crafted by the client, guided by the questions and feedback from the coach. And the criteria for this new story is not necessarily whether it is true but whether it seems believable, plausible, by the client and is coherent with how they see themselves or would like to see themselves.

Coaching is about change and that can occur at a number of progressively more difficult levels; at the behavioral level change can be relatively easy, a change in beliefs is more difficult but tends to be easier than a changing identity. Drake (2007) suggests that narrative is used most effectively at the identity level. Inevitably it involves different behaviours and different beliefs, but the existence of a coherent story removes or minimizes the earlier tensions and makes the change more likely to occur. Through attentive listening and insightful questioning the coach is able to help the client craft a new story that encourages, or permits, the existence of a new identity from the many possible selves that existed.

In summary, the stories we tell reflect our identity; we are our stories at all stages of our lives but we are also aware of other possible selves and these may provide us with the motivation to change.

5 Writing the meta- narrative

In scripting the simulation we are drawing together the various aspects we have described; pedagogically the narrative needs to encourage constructive learning, provide guidance, and be engaging; it has to emulate a coaching session, and that includes both the client's story and the story of the coach's strategy for helping the client craft a new story.

The process that Phillips & Huntley (2001) have described is particularly appropriate for developing interactive media. They consider that there are three stages in crafting a narrative. *Storyforming* is about the structure and meaning of the story; *Storyencoding* is about the symbols used such as the characters, settings and so on. As an example, Romeo & Juliet, and West Side Story share the same storyform but are encoded differently. *Storyweaving* is the stage at which the author decides how to tell the story, and in the case of multimedia decides what will be visual, graphic, text, audio, animated etc. In our coaching simulation the client Susan and the Mentor use audio and are shown as simple cartoon characters, while the learning support narrative is a mixture of text and audio. But how can we best address the coach's story, that of the learner who is using the simulation?

6 The learner's contribution to the story

The learner using this simulation is learning through problem solving, role-playing the part of the coach with Susan, the simulated client. He or she must discover Susan's story through questions, sometimes reflecting back what they have heard, and then help her design a new story that satisfies her chosen goal(s), again through asking questions, rather than giving advice. The problem the learner is addressing is deciding the most appropriate response to Susan's input. That is what is being learnt at surface level but at a deeper level the learner is discovering their own feelings and reactions to what the client is saying. Becoming a coach means learning about oneself in the process. So the simulation should also encourage self-awareness in order to be at least as effective as a live role play.

Commonly, interpersonal skill simulations use multiple choice as a way for the learner to interact with the story¹. Yet in real life the learner will not be offered choices but will have to formulate their most appropriate response from the content of what they hear and the manner in which it is said. The issue for the student coach is about synthesis and creativity and mastering a process, rather than identifying a series of correct responses. Unlike an actor with a fixed script, the coach needs to be able to adapt to the situation and the client. It is the ability to achieve a successful outcome from the whole coaching conversation, rather than an individual correct response, that determines the effectiveness of the coach. While multiple choice can be very effective in both the formative and summative assessment of learning, our feeling is that it doesn't address the issue of learning in the role, realistically. At present we are exploring the feasibility of using natural language processing techniques in order to allow the learner to give unscripted responses within the simulation. If successful, the learner will be able to contribute much more realistically to the narrative of the coaching session, a factor which we hope will impact positively on the development of their coaching skills more broadly.

7 Summary

We learn through stories and we express our identities as stories. In crafting a coaching simulation, a meta-narrative, we have integrated both aspects of narrative. We are now investigating ways to allow the learner to be involved in a manner that is more realistic, and more situated than multiple choice options.

¹ such as the programs produced by Skillsoft, a global provider of e-Learning (www.skillsoft.com)

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Towards Intelligent Educational Interactive Narrative for Ill-Defined Domains

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Abstract

This paper describes a system that aims to improve learning within interactive narrative (IN) environments. The system incorporates intelligent tutoring techniques (IT) that promise to enrich the learning opportunities for students/players by offering a wider scope for intellectual study through individualized guidance and support within the learning environment. We envision the system in a way that presents the user with not only interesting story-like experiences, but also teaches concepts that emphasize the important aspects of the learning target. The system engages the student/player in a continuous story where he interacts with different *teaching moments* (narrative components that focus on specific learning target concepts). This interaction allows the student to see the consequences of his choices and decisions in a safe environment. We claim that such a system can lead to a deeper understanding of the learning target; ethics and citizenship.

Keywords: interactive narrative, intelligent tutoring systems, educational systems, ill-defined domains

1 Introduction

AI-supported educational systems (AIED) have greatly advanced in recent years both as research tools and as teaching applications in *well-defined* domains. Such domains characterized by a well-accepted theory/model that makes it possible to unambiguously classify problem solutions as correct or incorrect. In contrast, ill-defined domains have open-textured concepts, where some problems have ambiguous solutions that can be argued for (and against) but that are impossible to verify formally. Although it is very important to educate ethical behaviors as to educate minds, the ethics domain offers many challenges. The answers in this domain depend, in part, on how the problem is conceived and justified. In addition, an ethical dilemma may have no “good” solutions at all, or it may have multiple ones.

Intelligent tutoring systems (ITSs) proved their effectiveness as an AIED over other existing alternative learning modes [7, 9]. Many ITSs has been developed in well-defined domains such as [5, 10, 15]. Only few have tackled ill-defined domains especially ethics, for example [6] that introduces an ITS to teach the analysis of bioengineering ethics cases. Another tool used in education is interactive narrative (IN), where classroom drama is now a widespread component of primary and secondary school curricula [17]. IN proves to be successful in sparking problem solving skills and individual as well as group decision-making skills. It also enabled teachers to introduce sensitive issues in a safe and stimulating environment. In addition, IN can contain dialogues that help in improving problem solving as well as declarative knowledge acquisition by students and the transfer of tacit knowledge [1, 2]. For example, the virtual bullying drama presented in FearNot! [14], the military leader-training scenario in IN-TALE [11], the TIME system [16] used to teach medical concepts and TEATRIX [13].

The main drawback of the above-mentioned interactive narrative systems is that, although these systems have been applied in education, none of them used cognitive tutoring. We claim that the existence of a cognitive tutor helps the system to keep track of the student progress and to give personalized feedback, which has proved its importance in the learning process [3]. Consequently, we are introducing the idea of integrating IT and IN in a single hybrid system to teach in ill-defined domain.

It is believed that students learn best when they gain knowledge through exploration and active learning [8]. In this paper, we present an Addaptive Educational Interactive Narrative System (AEINS), an active

learning environment. The idea is centered around the use of *teaching moments*, components of the narrative that are focused on specific learning target concepts. The student/player is engaged in a learning process that involves constructing one's own knowledge from one's own experiences and personalized feedback. Applications of this system can be in a wide range of domains, for example teaching ethical concepts, or a medical domain, such as dealing with some psychological problems, or supporting people with permanent or temporary disabilities who are unable to participate in the experiences of the real world.

2 AEINS: Addaptive Educational Interactive Narrative System

AEINS integrates on one hand, intelligent tutoring that provides the user with personalized educational environments. On the other hand, interactive narrative attempts to generate a story in which the user is able to perform actions that dynamically affect the direction and/or outcome of the story. The system architecture is presented in fig. 1. The system provides the user with a continuous story that the user is part of and able to influence. The user is faced with ethical dilemmas where he has to take decisions and observe the consequences in a safe environment. The student model is updated according to the student's actions and the pedagogical model keeps track of the learning procedure.

Figure 1 illustrates the architecture of AEINS and the various components have the following functions: The principles of citizenship and ethics are used to structure the domain model and develop different versions of teaching moments (dilemmas). The desired concepts and their relationships have been specified. The teaching moments are a crucial part of the story generation process. They have certain prerequisites that must be fulfilled before the execution of the teaching moment takes place. Each teaching moment represents part of the whole story and focuses on certain domain concept(s). The interaction of the student with the teaching moments is monitored and evaluated.

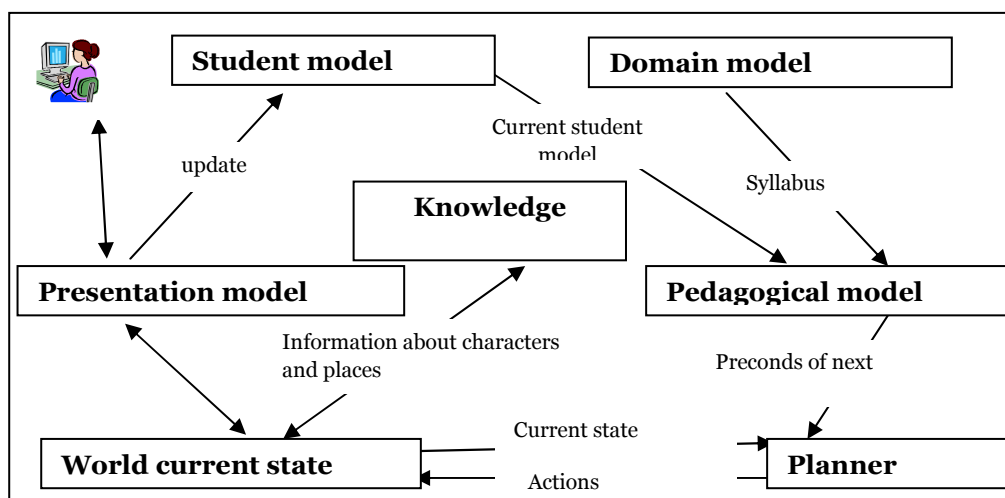


Figure 1: AEINS Architecture

Recent work on student models aims to participate the player in an engaging drama by modelling the player's character [12] for example (*heroism, self-interest, and cowardice*), or to maximize player enjoyment of their experiences in a virtual world through modelling the player's style of playing [4] for example (*fighter, power gamer, method actor, etc.*). We aim to model the player's beliefs in order to guide the educational narrative, for example *belief (stealing, bad, strongly)*. The first parameter denotes the principle, the second parameter is what the student beliefs about the concept, and the third parameter is the extent of his belief. Through the game play the student beliefs are updated based on the player's actions. Using the student model, the pedagogical model is responsible for reasoning about the student behaviour and determining the next suitable teaching moment. The pedagogical model is able to present more teaching moments in a way that fosters the student's understanding about certain concept if required. In addition, it can present the student with new teaching moments to assess his performance.

The current State contains the current information about the whole game world. The knowledge Base contains a description of all possible actions and the properties of the teaching moments, for example number of characters and the appropriate location to occur. The planner helps in achieving content coherence, its main role is to find the proper actions that link/transfer the current state of the world to the desired state; the preconditions of the next teaching moment. The second role of the planner is either to accommodate the user's actions if possible or to re-plan if the user's actions invalidate the current plan. Finally, the presentation model handles the flow of information and monitors the interactions between the user and the system and vice versa.

3 Conclusions and Future Work

In this paper we proposed the idea of integrating interactive narrative and tutoring techniques to teach in ill defined domains. AEINS is a narrative-based educational environment aims to teach ethics. The idea has been proposed and the architecture of the system has been discussed. A prototype has been implemented which is able to generate a connected story that incorporates the teaching moments, taking into account the individual student/player's features and behaviour and this affects: i) the choice of the teaching moments ii) the order in which the teaching moments should be presented, iii) the taught concept, and iv) the coherency of the storyline. Future work extends the implementation of the ethical dilemmas and the student model.

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Learning through the construction and use of intelligent image narratives

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Currently there is a great deal of interest in how software can support users beyond the search and retrieval process and closer to the higher level goals that the user is trying to achieve. Examples include exploratory search systems that attempt to assist the user in building conceptualisations that span a number of retrieved resources (White et al 2006; Mulholland et al 2008). Similarly, within an educational context, there is continued interest in how software can support inquiry learning from digital resources, in which the learner interprets the resources toward achieving some higher level goal such as answering a question. Examples include support for teacher selection and organisation of materials (Davis et al 2006) and learner annotation of digital resources (Quintana and Fishman 2006).

Content in the form of images provides interesting challenges as the source material for exploratory search or inquiry learning activities. Although resources of any media type can be interpreted in a number of ways, this is a particularly strong feature of images such as photographs and paintings. The broad range of interpretation perspectives means that a single image may be usable in a number of inquiry learning activities focussed on different topics and also that the same image could lead the learner to different conclusions depending on the perspective they have taken. The learner may also require relatively more scaffolding in order to guide or explicate their interpretation of the source materials. Another interesting aspect of images is their use as a sign or icon of some concept or activity. In a study of the use made of interactive whiteboards in the classroom, teachers were found to use an image as a pointer to a previous body of school work in order to set the context when it was revisited or make cross-curricula connections (Littleton et al 2007).

Within the SILVER project we aim to support learners and teachers in the construction and use of interactive narrative presentations bringing together images and their organisation and annotation in order to address some given problem or question. Within SILVER we refer to these as Visual Interactive Publications (VIPs). SILVER is an EPSRC/Technology Programme collaborative project with the Bridgeman Art Library and Lexara, a technology company working in the education and museum sectors. Within SILVER we are developing a general software architecture and methodology with which a number of demonstrator VIPs will be developed.

When using a VIP, the learner will, individually or collaboratively, work through some task in which the images are being used as a source of evidence or as prompts or reminders to their own conceptualisation of a topic. Learner organisation and description of the images, in combination with image metadata and task models, will be used to identify patterns in the learner's behaviour which are then fed back to the learner either by highlighting the pattern and/or suggesting further content or alternative organisations of content that will help them further develop their thinking. Through the task, the learner will evolve an interactive publication capturing their conceptualisation of the question or topic.

The VIPs we are currently developing are related to the Key Stage 3 curriculum for Citizenship. For example, one VIP we are developing is focussed on the right to vote. In this example, images from the suffragette movement are used to identify the methods of campaigning used and how these changed over time. Another VIP is intended to help learners unpack what is meant by human rights. Here, the learner takes a set of images and organises them according to whether they think the image illustrates an abuse of human rights and explains why.

The technical work on SILVER has three main aspects. First, images held by Bridgeman Art Library are being selected and associated with metadata appropriate to the learning domains in which the images will be used. Second, reasoning support is being developed for the identification of patterns in learner

behaviour and using these to guide the learner. Third, domain-independent presentational templates are being developed that can be used to deliver VIPs conforming to different kinds of visual learning task such as organising images into a set of categories, adding comments to part of an image or organising images on a timeline. This is being developed on the Magic Studio interactive content authoring platform (<http://www.magicstudio.co.uk>). Work on the SILVER project so far has focussed on development of the technical infrastructure, requirements analysis and the development and testing of a range of low-tech prototype VIPs.

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Narrative & New Media

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The presentation looks at the Narrative Interactive Learning Object as an abstract entity: in other words, simply as a new media object. The aim of the presentation is to look closely at some of the assumptions made about the narrative form, and attempt to resolve some of the problems and contradictions associated with using narrative within a hypertextual environment. For example, it is widely recognized that interactivity and narrative are inversely related (because the hypertextual nature of a new media object calls into question both the wholeness and the fixed sequentiality of the narrative), and yet narrative is widely used within e-learning environments in an attempt to impose coherence and structure onto the learners experience.

The presentation will begin by establishing the fundamental characteristics of the new media object along with the types of behaviours these characteristics engender. This will include a short discussion on interactivity and a brief summary of the terminology used to describe narrative new media objects (e.g. non-linear narrative, interactive narrative, hypernarrative, multiform stories, interactive stories, etc.).

This will lead on to a discussion of the frequently used distinction between linear and non-linear narrative. This will encompass the notions of plot and the dramatic arc and lead towards a 3D visualization of the narrative form.

The presentation concludes with a discussion of narrative as a function of the medium in which it is embedded. A brief historical overview of the development of narrative as a function of medium is included, which suggests that our conceptions of narrative are heavily biased by the print-based literary theorists. Electronic media can be shown to be generating completely new narrative forms, and the question becomes: *what are the narrative forms for new media?*

“Traditional Narrative Structure” – not traditional so why the norm?

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Abstract

This paper suggests that viewing traditional narrative structure with its climactic plot as a norm diminishes the importance of all other narrative structures. It demonstrates that rather than being traditional, this structure is a fairly recent upstart in narrative history, that young children view story as structured differently before schools channel their ideas through language arts curriculum, and that young children engage with stories as experience rather than structured texts. Maintaining such a norm denies a rich source of different forms of narrative expression on which game developers can draw, and fails to support the genres being explored within digital media today.

1 Introduction

Narrative was disassociated from literature during a “narrative turn” in the humanities in the mid-twentieth century and shown to be transposable to other disciplines including psychology, health sciences, and education. It came to be acknowledged as a cognitive style and as a way to structure meaning and worldview. As a form of enculturation, however, it has long been used to shape the experience of children in context of the society within which they live. It is through story that children construct their knowledge of the world, form their identity, and maintain their identity (Bruner; Polkinghorne; Barthes). Originally narratives or stories were shared orally. From the time moveable type could mass-produce text in the mid-fifteenth century, print text evolved to be a primary means of communication and the way in which culture and knowledge were shared (O'Donnell; Eisenstein; Ong). From the eighteenth century on, print narrative expressly directed at children took on an increasingly important role in their understanding of the world. Schools, in particular, as they evolved from the seventeenth to the twentieth century, adopted books as a means to educate (Jackson; Spufford; Minns). Although radio, film, TV, and video were introduced as communication media in the twentieth century, print maintained its importance as a means by which children in western societies acquired knowledge of their world in home and school settings (Huntington).

From the late 1990s digital media increasingly became a point of intersection and interpretation between children and the world, one that children themselves embraced with enthusiasm. Games, like books, provide stories for children to experience. Although games have not replaced activities such as reading or being read to for toddlers and preschoolers, they are increasingly being used for education and entertainment as new systems are designed for younger children. Many games claim they provide an engaging story within which to play. And some do. But the range of narrative offered is meager in its presentation of story schema and severely limited in its breadth of world experiences and values. While books introduce children to a complex world of ideas and emotions through their stories, games, though they have the potential to offer more, currently provide only a slim selection of story types.

Writing in 1997, Janet Murray offered a promising view of the evolution of narrative expression in new media: “This book is an attempt to imagine a future digital medium, shaped by the hacker’s spirit and the enduring power of imagination and worthy of the rapture our children are bringing to it.” Murray envisioned a storyteller who is half hacker, half bard; one who tells stories in a medium that “promise[s] to reshape the spectrum of narrative expression, not by replacing the novel or the movie but by continuing their timeless bardic work within another framework” (Murray pp. 9-10).

Murray’s vision is barely perceptible when viewing today’s narrative game offerings that feature arcade-style, often violent, action. There have been many impediments to the development of diverse narratives in games, among them: the perception that only action keeps the user engaged, the reality that authors

who write stories are still grappling with changing technology and the associated paradigm shift, and the argument that games, because of their interactive nature, cannot support what has been called “traditional narrative structure.” It is this last issue which I address in this paper.

Fueled throughout the 1990s by the increasing academic evolution of ludology as a theoretical study, the belief that a traditional narrative arc with a sequential climactic plot is the norm for narrative has been maintained and strengthened within the gaming community through constant repetition (Frasca). This belief, that stories are of necessity based in climactic plot, creates barriers to the exploration of the kinds of narrative that can be used with interactive games. It works against print authors entering the game field, and against game developers using the broad range of narrative available to them in print stories. A more comprehensive view of the broad and diverse nature of narrative’s structure, as it has evolved over the centuries and as history reveals it to us, would acknowledge that existing print narratives possess a legitimate structure for games (Madej). It would also acknowledge that the different types of stories in games have legitimate narrative structures.

2 “Traditional” Narrative Structure

Within the long history of narrative’s development, what is currently considered classical or traditional narrative structure (often labeled “Aristotle’s Arc”) – a sequence of events with a beginning, middle, and end, that consists of an introduction, climax, and denouement – has been the dominant structure, not since classical times, but only since the mid-nineteenth century. Narrative structure that evolved from the time of Homer such as epic, interlace, and frame structure, which place less emphasis on sequence, on formal beginnings and endings, and on plots, have been more enduring (in some cases by 2600 years) and are more in accord with the process of peoples’ lives (Ong; Doody).

Contemporary audiences will look at a model of such a structure (See Figure 1) and find it obvious, as much of today’s writing follows this pattern. The audiences of ancient Greece, however, would not find it familiar; its simple and sequential nature does not reflect the complexity of either their drama or epic. In *Orality and Literacy*, Walter Ong explains that the audiences of Aristotle’s day had little experience in organizing even short, climactic linear plots. The type of tight organization that exists in such plots was not possible to achieve in stories that were not written down. Unlike the majority of the narrative forms of the time, however, the dramatic tragedy “was the first verbal genre and for centuries was the only verbal genre, to be controlled completely by writing” (Ong). It is the structure of *dramatic tragedy* that Aristotle writes about in *The Poetics* using the terms that we have become familiar with. Let us note, also, that his discussion includes elements of ancient dramatic tragedy which have been progressively excluded over the ages because they were no longer relevant. These include: “Prologue, Episode, Exode, and a choral portion, distinguished into Parode and Stasimon; these two are common to all tragedies, whereas songs from the stage and Commoe are only found in some” (Aristotle). Such elements were integral to the way the story was revealed and understood and were important because to the audiences of ancient Greece drama was not about climactic plot that was unraveled, but about myths which were revealed by singers and an all-seeing chorus, myths that epitomized the “spiritual allegiances of a people” (Whitman). Audiences became familiar with the rhythms, repetitions, and episodes of the oral epics: the stories as sung by rhapsodes over centuries to pass on the history and legends of a people.

Mass-production methods afforded by the printing press in the fifteenth century increased literacy and more authors had the tools at hand to create a unified plot. Unlike oral performers, print authors could outline stories and organize and manipulate the chronology of events more easily. They could be selective about choosing events and arrange them to show causality, they could create a tighter story, and they could provide “a firmer sense of closure.”

This new affordability coincided with a growing interest in the narrative theories of Aristotle which had lain dormant in the west for over 1500 years. Literary commentaries of the fifteenth and sixteenth century discussed print text dramas of the time in light of theories found in *The Poetic’s*. By this time “Aristotle’s Arc” had been stripped of many of its integral “ancient” parts such as the chorus. In the

eighteenth and nineteenth century, the evolution of the novel as a genre saw the introduction of plot to theories of narrative structure. Then in 1863, Gustav Freytag, a German writer, offered in his book *Die Technik des Dramas*, an analysis of the classic five-act dramatic tragedy. He proposed a model for dramatic structure that used the view of Aristotle's continuum of beginning, middle, and end, and was based on the function of the five acts of the drama (Figure 1) (Stern; Thursby).

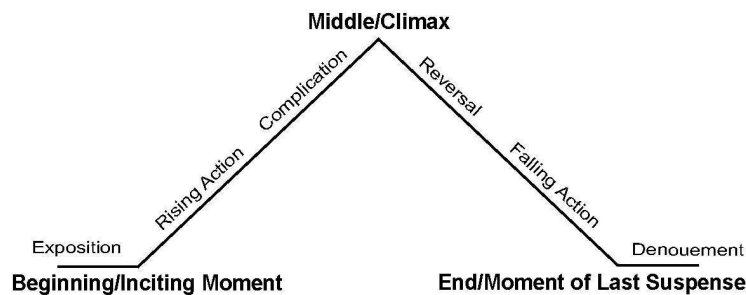


Figure 1: Traditional Narrative Structure," also known as Aristotle's Arc and Freytag's Triangle

The combination of Aristotle's and Freytag's theories in a structural model proved itself useful in discussions and criticisms of all narrative genres and increasingly became the convention not only for drama, but for comedies, short stories, and novels as well. When such a structure is adopted as the norm for narrative, the implication is that all narrative requires rising tension and high points, or climaxes, to be satisfactory. This, in reality, is only the case in certain types of narrative. Walter Ong suggests that the most obvious use of such a model is the mystery story. In its simplicity and single-minded approach to reaching a climax, the basic mystery story is an exemplar of the climactic linear plot (Ong). The different approaches to structure that have been used throughout narrative's history, such as episodic, interlace, and frame, and the modernist and post modernist experimentation since this model evolved, are not reflected in it, yet it is perceived as a norm (Phelps).

There are a number of reasons for this perception. One, the increase in literary materials, and the subsequent rise in literary commentary and criticism created a need for a baseline for analysis and comparison. Nineteenth century critics found Freytag's model, with its emphasis on plot, useful for analyzing literature in which the genre of the novel was becoming increasingly dominant. Two, the increase in mandatory education that occurred during the end of the nineteenth century created a need for literary standards that could readily be adopted by the curriculum of the day. At a time of industrialization and institutionalization, the need for a critical standard encouraged the use of an available, useable model. Since then, this structure has been reified and held up as the norm (Madej).

As new communication media emerge they adopt and repurpose or remediate narratives. Even as each medium explores and creates its own aesthetic, the structure of print narrative is the standard that has been applied to narrative in all media. While such a narrative structure lends itself to remediation in media such as radio, television, and film, in which control stays with the author (Bolter), in digital media, where the opportunity for control of story by the audience is possible, the remediation of print narrative is more complex. The appropriateness of narrative's use with game play in particular has been argued extensively (Salen). Many media theorists use traditional narrative structure as a basic tenet in their theoretical work (Laurel; Crawford; Ryan). During games' early development period, the game designer Greg Costikyan identified in his article *Learning from Fiction* (1988) the understanding of narrative that many game designers had: "The first and most important difference between story and game is that stories are linear. That is, they have a beginning, a middle, and an end" (Costikyan). By the late 1990s, as more theorists entered the field with new viewpoints on narrative and games, the arguments heated up. Ludologists argued that classic narrative principles were fundamentally incompatible with the interactivity of games; narratologists argued (among other things) that games can produce dramatic encounters that are storytelling in nature (Frasca). Jesper Juul, a ludologist at the heart of the "clash between games and narrative," suggests in *Games Telling Stories* that there are similarities and

differences, but that “at heart” we must allow for distinctions (Juul). Media scholar Henry Jenkins argues a middle road in *Game Design as Narrative Architecture* that acknowledges the narrative’s tremendous potential and encourages its evolution as a spatial environment within gameplay (Jenkins). Brian Mallon and Brian Webb, researchers into the nature of narrative and games, note in *Stand up and take your place* that a key issue in the debate is “the usefulness of applying traditional narrative-analysis to games” and that “a consensus has been reached that not all aspects of traditional narrative theory apply to interactive narrative”(Mallon). Salen and Zimmerman’s quote from J. Hillis Miller in *Rules of Play* (2004): ““There must be, first of all, an initial situation, a sequence leading to a change or reversal of that situation, and a revelation made possible by the reversal of the situation,”” shows how little progress has been made towards a new way of thinking about narrative in games even after 16 years of discussion (Salen p. 380).

The debate over whether games are a suitable delivery medium for narrative is unlikely to ever be concluded (loyal adherents being what they are), but in reviewing it briefly we can see that the concept of traditional narrative structure underlies many of its arguments. This structural model is continually reinforced from the time it is introduced as a formal concept through language arts curriculum to children in kindergarten and then throughout elementary, middle, and, high school, as well as college and university. Books and websites provide advice on writing and stress the importance of using basic narrative structure when composing story. Literary critics discuss stories found in magazines, books, and non-print media such as film and video in terms of plot and climactic structure. Traditional narrative structure, classical narrative structure, basic narrative structure, and climactic structure are different names for the same thing: a narrative structure that has become the norm through a process of education and reinforcement from the late nineteenth century until now.

3 School Curriculum

Classic narrative structure is taught in language arts curriculum in many English-speaking countries. A 2007 review of Canadian and U.S. programs (Madej) shows that a primary goal of curriculum developers in these two countries is to make children into “independent and fluent” readers who are familiar with conventional narrative structure (*The Ontario Curriculum Grades 1-8: Language*). A review language arts programs shows that a progressive approach is used to introducing narrative structure in elementary school over a number of years. Public and private school teachers in Canada, the U.S., England, and Australia use resources such as the *Oral Resource Book* and the *Writing Resource Book* that provide descriptions of activities within a structured progressive curriculum. Other resources teachers use are “leveled books for guided reading” such as those in the “Ginn Reading Steps” program (Pearson Education). These books follow the same type of progressive approach.

Curricula used in different locations show evidence of a common ground: learning outcomes are similar, though they may be categorized differently, identified or named differently, and expected at slightly different ages. Learning outcomes range from general outcomes – “enhance the clarity and artistry of communication” (Western Protocol) – to specific outcomes – “distinguish between fact and opinion” (Washington State). The Washington State program has a highly specific approach to identifying outcomes and provides us with an example of language arts teachings that can also be found, to a greater or lesser degree, in other programs.

Figure 2 shows how skills are introduced progressively. The program takes children from learning about “beginning, middle, and end” in kindergarten to identifying “the major actions that define the plot and how actions lead to conflict or resolution” in Grade Five.

Kindergarten
<ul style="list-style-type: none"> • Retell familiar stories using a beginning, middle, and end.
Grade One
<ul style="list-style-type: none"> • Retell stories with correct sequence of events.
Grade Two
<ul style="list-style-type: none"> • Retell text focusing on the problem or events in sequence. • Recognize and use sentences, paragraphs, and chapter structure to understand the organization in both informational/expository text and literary/narrative text
Grade Three
<ul style="list-style-type: none"> • Understand sequence in informational/expository text and literary/narrative text. • Explain story ideas or events in sequential order.
Grade Four
<ul style="list-style-type: none"> • Recognize and explain literary/narrative text written out of sequence • Identify the main events in a plot, including the cause and effect relationship • Identify and use text written in the organizational structures of cause and effect and order of importance to find and organize information and comprehend text.
Grade Five
<ul style="list-style-type: none"> • Identify the major actions that define the plot and how actions lead to conflict/resolution.

Figure 2: Language Arts Curriculum

Once children are thoroughly grounded in these concepts they *are* introduced to new genres and alternative structures, particularly in middle schools and high schools. Indeed, exploration of new and different structures is often encouraged. These are, however, considered to be *divergent* from the norm. At a university level, where the study of non-conforming literature is more than likely *the* norm, the convention of the linear climactic plot still defines the foundation on which much critical analysis is based. University narrative course references such as Michael Toolan’s *Narrative, A critical linguistic introduction*, and Nick Lacey’s *Narrative and Genre: Key Concepts in Media Studies* reinforce the norm. Toolan sees “sequenced and interrelated events” and “crisis to resolution progression” as defining features of narrative (Toolan). Lacey writes, “What distinguishes narrative from other forms is that it presents information as a connected sequence of events. The most basic narratives are linear sequences... Most narratives structure their sequences causally, each event logically follows on from the previous one; each event causes the next one...” (Lacey).

This approach to narrative perpetuates the belief that traditional narrative structure is *the* paradigmatic convention for narrative. It is often used as the litmus test for what constitutes narrative in research as diverse as children’s understanding of narrative and narrative use in games (McGregor; Costikyan). This stance, however, diminishes the importance of other narrative structures, some of which are much closer to the process of human experience and expression. Climactic structure that is a product of dramatic criticism cannot sustain the diversity of narrative that the human condition warrants (Mallon). The direction we take for constructing a broader framework from which to conceptualize narratives for all media needs to include this important understanding – that narrative is based in process and experience rather than structure, and the climactic plot does not reflect the process of our lives very well.

4 A Different Paradigm

Studies based in traditional narrative structural norms such as Karla McGregor’s *The development and enhancement of narrative skills in a preschool classroom*, show that early intervention in children’s experience of narrative between the ages of three and five provides for development of traditional narrative literacy moving from descriptions of objects and events to include causal and temporal sequencing of actions. If this intervention does not occur children do not easily recognize these patterns of storytelling as they move into their early school years, and have a more difficult time accessing the

print materials they are provided (McGregor). Bruner in *Actual Minds, Possible Worlds* tells us that “human mental activity depends for its full expression upon being linked to a cultural tool kit – a set of prosthetic devices....” (Bruner) Traditional story structure is the narrative prosthetic device of choice in western culture. When provided this device, children develop a traditional sense of narrative as they move from the iconic to the symbolic stage in their development. They develop a different sense of narrative when they are not provided this device. Anna’s story shows us this different sense of narrative.

4.1 Anna’s View of Narrative

In “Prelude to Literacy: a preschool child’s encounter with picture and story,” Maureen and Hugh Crago describe the emerging narrative process of their daughter from the ages of one to five, before she learns to read (Crago). Three conclusions they arrive at provide insights that are tantalizing in light of the structure of game narratives.

The Cragos conclude that the traditional plot, character, and theme structures we traditionally assign to narratives do not seem to be useful in looking at the narrative experience of young children. Their observations show that Anna’s basic structural unit is a short binary episode that consists of an event followed by its opposite, rather than an entire composition. Generally this episode is dramatic or has emotional appeal. The general binary pattern of these “chunks” is one of loss and restitution, but not necessarily; it is sufficient that the episode have two parts such as “‘two opposed characters dialoguing’, or ‘protagonist-acting’” (Hunt p. 72; Crago). At the age of five, after having heard hundreds of stories and discussed them extensively with her parents, Anna still maintained episodes of “binary opposition” as the structural units within her perception of narrative.

Contrary to traditional narrative theory, Anna assigned beginnings and endings to ritual status or considered them verbal tags without any connection to what went between. She was impatient with setting the scene at the beginning of a story. At the end, typical conclusions seemed to be rejected as unimportant or redundant. Once the binary incident was over she consistently stopped listening to the story. There were stories in which she didn’t recognize the ending for what it was and asked what happened next, with the expectation of hearing more episodes.

Longer, novel-type stories, Anna saw as a string of dramatic incidents. An important factor in linking these episodes was the presence of a central character. The Cragos offer the example of the characters Luke and Jim in the story *Jim Button and Luke the Engine Driver*. In this story “Luke and Jim’s lengthy quest for the Chinese Princess Li Si is the unifying device” (Crago p. 280). Anna got to know these characters and brought their comforting familiarity with her to what she considered each new episode.

5 Preschool to Kindergarten: A Change in Approach

The study *The Dynamic of Young Children’s Emerging Narrative Process* observes children encountering narratives in a preschool and a kindergarten setting (Madej). The study findings show that there is a shift in teachers’ approach from bringing story to children as experience in preschool to teaching story as structure in kindergarten. In the preschool class, print story is moved from words on a page to an experience. The teachers regularly associate stories with music, with art/craft activities, and with other play activities such as puppetry or playacting. While the story the teacher reads may have a sequence, this sequence may not always be first in importance for children. At times the teacher emphasizes parts of the story that are most suitable for introducing a specific activity, such as making a craft, a fingerplay, or a musical activity. At other times, parts of the story which children enjoy hearing over and over again are told, again and again. When creating stories, the children use beginnings and endings (Once upon a time, The End) as brief rituals. The stories themselves are often treated as a series of events without climax. These events are often made personal through anecdotes that are introduced into the reading, listening, or playacting and may not relate to the story at all but happen to be at the forefront of a child’s mind, such as a recent activity with a parent or friend might be.

In the kindergarten class, the teacher begins to teach traditional story structure by introducing sequence, character, and setting of a story that she first reads aloud. Through activities such as drawing and playacting, the teacher familiarizes the students with narrative terms such as setting, character, and plot, and the concepts behind the terms. Though story moments may be highlighted through action (such as making snow angels), the story is presented as a sequential whole. Sequence is introduced and reinforced through activities such as ordering scenes taken from the book, and by making and discussing story maps. Narratives in this kindergarten class are still associated strongly with art and craft and with action and performance, not only with text.

While in the preschool children experienced story with little concern for explanations about how story is structured; once they moved into the more formal kindergarten they were introduced to elements of print stories such as sequence as part of their experience of the story.

6 Summary

Traditional narrative structure evolved as a combination of Aristotle's narrative arc of beginning, middle, and end, and Freytag's climactic plot. A development of the nineteenth century, this structure is neither traditional nor classic. Other narrative structures, such as epic, interlace, and frame structure, have endured longer and better reflect the process of life. Language arts curriculum in schools establishes this structure as the norm in English-speaking western society where it is reinforced daily by common use. This norm underlies research in a range of disciplines such as education and games that explore narrative use. As a contrast, a study of Anna Crago's views of narrative as a young child shows she saw narrative structure differently. For her, beginnings and endings had only ritual importance, and binary actions or events and favorite characters held the day. Viewing traditional narrative structure with its climactic plot as a paradigmatic diminishes the importance of all other narrative structures. Assuming this restrictive norm limits the direction that exploration of narrative takes. It denies a rich source of different forms of narrative expression and fails to support the genres being explored within digital media today.

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Children's Story Authoring with Propp's Morphology: An Exploratory Study

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Abstract

This paper is part of an investigation of the use of Propp's morphology as a story writing tool for children, with the aim of creating a computational tool for teaching storytelling. Early quantitative results are presented from an exploratory study in which participants aged 7-11 wrote stories using a paper-and-card interface based on Propp's morphology. The general research questions are: can children apply this tool to story writing? how successfully do they use it? and what do they do with it? An experimental methodology suitable for answering these questions was devised, and can now be developed based on our experience. The quantitative results show that children were able to apply the tool to story writing with a high degree of success. Further qualitative analysis of the data from the study will identify the adequacy of Propp's morphology and inform the design of a computational tool.

1 Introduction

The long-term objective of this research is to construct a tool to help children write stories by allowing them to view and interact with their plots at different structural levels, and keep track of the constant and variable elements. The tool requires a formal model of narrative structure, which we aim to develop based on Propp's morphology. The current study aims to empirically verify whether children are able to recast and generate stories using Propp's morphology. Previous applications of Propp's morphology in this field, e.g. Rodari (1996) and Charles (2006), have been somewhat informal and are underspecified. This study provides the first step in developing a more formal model.

In *Morphology of the Folktale* (Propp, 1968) Propp "devised a very simple method of analysing wondertales in accordance with the characters' actions---regardless of their concrete form" (Propp, 1984, p.69). Propp noticed that "if the hero leaves home in quest of something, and the object of his desires is far away, he can reach it by magic horse, eagle, flying carpet, flying ship, astride the devil etc." (p.73), but in each case the function is "the transfer of the hero to the place where the object of his search is located." The tale consists of both constants and variables. The concrete form of the characters, their world and actions is variable. But the *function*, "an act of a character, defined from the point of view of its significance for the course of the action" (Propp, 1968, p.21) is constant.¹ "This explains the two-fold quality of a tale: its amazing multiformity, picturesqueness, and color, and on the other hand, its no less striking uniformity, its repetition." (p.20)

Propp's thesis rests on four basic observations. First, that functions are the "stable, constant elements in a tale" (Propp, 1968, p.21). Second, the number of functions in his corpus was "startlingly small," 31 functions in total. Third, Propp discovered that although all tales do not contain all functions, "the sequence of functions is always identical" (p.22). Fourth, Propp concludes that all tales studied are of a single structural type.

Propp's morphology has seen many applications beyond its intended use as a system for classifying folktales. This study builds on two examples of Propp's morphology applied to creative story writing with children. Rodari, 1996 describes several games for use in schools that use popular folk tales as raw material to invent new stories. A game which Rodari calls "recasting" a fairy tale (Rodari, 1996, p.39) creates new tales out of old ones by revealing the underlying structure of the tales. Recasting a story is a

¹ This definition of function has two aspects. As well as the action itself, the position of a function relative to other functions in the tale (what Levi-Strauss called the context of the function (Levi-Strauss, 1963)) also forms part of its definition. "An action cannot be defined apart from its place in the course of narration" (Propp 1968, p.21). We have seen that different actions can instantiate the same function. In some cases different functions may be instantiated by the same action if the contexts of the action differ.

three step process: first the tale is reduced to a bare synopsis of the plot events, then the names of characters, places etc. are replaced by signs, reducing the plot to an abstract formula. Finally the abstract expression is reinterpreted as a new story. For another game Rodari created a set of playing cards ("The Cards of Propp") each marked with the title and an illustration of one of Propp's functions, which were used in story writing games in which the story must be structured according to the cards. Rodari's experiment was a success, the children easily succeeded in creating fairy tales that followed the cards (Rodari, 1996, p.47).

A similar use of Propp's morphology by Charles (2006) aimed to empower children to create complete, original fairy tales, to "explore whether children could take ownership of folktales by recreating them," (Charles, 2006, p.46), imbuing them with personal meaning and using them to rehearse real-life confrontations. Charles developed a prototype teaching tool that combines Rodari's ideas of recasting and the cards of Propp. The Propp functions of three fairy tales were each represented by a series of Propp's cards called a "story map," and the story maps were used to reveal the structure of the sample tales to recast them. Each session began with a telling of one of the sample stories before the story was collaboratively recast by a group of children facilitated by Charles, who helped the children follow the story map as well as encouraging their ideas. Charles found that "in all sessions, original and different stories were created that reflected the childrens' personal lives, the places they lived, and their knowledge of the world. The results of the study proved that contemporary children took ownership of folktales when provided with permission, opportunity, and guidance" (Charles, 2006, p.iv).

As Rodari's work is not an empirical study it presents no empirical evidence of the effectiveness of the Propp's cards, such as stories written by the children. Charles uses data from tape recordings of the class stories, children's drawings of the stories, and children's recollections of the stories three weeks later. But the stories in Charles' study were created by the class, with an adult facilitator. Charles studied the recasting process with Propp's cards, and did not explore other interesting processes, such as the generation of new story maps by the participants.

First, our study aims to empirically verify and clarify in greater detail whether children are able to recast and generate stories using Propp's morphology. Because we aim to develop a formal model for implementation, we find that the models presented by Rodari and Charles are underspecified. Quantitative and qualitative data was collected on each individual participant and on each individual function, giving us a wealth of empirical data from which to develop a formal model. The use of each function will be analysed to identify the more difficult functions and provide suggestions on how their use may be facilitated.

Second, our study aims to investigate the potential of the model beyond the process of recasting a story. The second part of our study concerns the process of generating new plot structures, as opposed to recasting existing plots.

The study illustrates a prototype methodology for testing the story model. Further studies will develop the methodology based on our findings. This paper presents early, quantitative results from the study. It considers the question of whether the children were able to apply Propp's morphology to story writing. Setting aside the quality or originality of the stories for now, our quantitative question is, how *accurate* are the stories? How closely do the stories produced match the Propp functions used?

2 Methods

A two-part study was carried out across two weeks at Collingwood Primary School, Newcastle. The first week, recasting, investigated the process of recasting stories using Propp's cards as story maps. The second week, generating, investigated the process of constructing new story maps without a sample story, and using them to write stories.

2.1 Participants

42 students of ages 7-11 participated in the first week of the study. 35 of these participants, aged 7-10, returned to participate in the second week. Signed informed consent forms were collected from the students and their guardians, confirming that they understood and accepted the conditions of the study, including the collection of video and audio data.

2.2 Materials

The three sample stories from Charles were used as stories to recast in the first week of the study. Cards for each of Propp's functions were developed with the name of the function, a brief description, and a picture.² Large copies of the Propp cards were used to make story maps representing the structures of the sample stories. Smaller copies with space for writing were used as writing materials for the participants, who were asked to write each function of their story on the card representing that function.

2.3 Procedures

The materials and recording equipment were set up in the school's library, and participants visited the library in groups of five at a time to participate in one to two hour story writing sessions. At the beginning of each session the participants were told that we were testing the idea of story maps for writing stories, and needed their opinions and ideas. They were reminded that it was the story maps, and not themselves, that were being tested.

WEEK ONE, RECASTING STORIES First, the teacher read out one of the sample stories while the students listened. The researcher then showed the participants the story map for the story they had heard, and explained which part of the story each card on the map represented.³ The participants were then told that it was time to write their own stories that would follow the map of the story cards. They were told that they could write about whatever they liked, using their own characters, places and actions. A short group discussion was used to generate ideas for stories.⁴ Finally the children were asked to begin writing when they were ready.

Three additional groups participated in sessions that used the facilitated, collaborative approach described by Charles (2006), in which the participants and the researcher recast the story together. No quantitative data was collected during these sessions, but the experience allowed for reflection on the process.

WEEK TWO, GENERATING STORIES The participants were reminded of the story cards and story maps concepts from the previous week. They were shown the complete selection of Propp's cards and given rules for choosing the cards for their story maps.⁵ After a discussion of themes and keys to generate ideas, the participants began choosing their cards and writing their stories.

One group in week two participated in the alternative, collaborative approach instead of individual story writing.

DATA COLLECTION Data was collected from several sources in all sessions. All participants filled out cover sheets with their name, age and sex. Audio and video of each session was recorded by a fixed-position camera focused on the table on which the participants were placing and writing on their Propp cards. A

² Simpler and sometimes modernised names and descriptions had to be developed for the functions, as Propp's work (translated from Russian) uses many difficult words: interdiction, reconnaissance, complicity, mediation, transfiguration, etc. Our replacements were based on those used by Charles. The cards were reviewed by the teacher, who suggested improvements before the study.

³ We found it effective to explain the story map interactively, so that the participants did not get bored. For each card participants were asked "Who knows what this card means?" or "Who knows what part of the story this card stands for?"

⁴ The discussion revolved around potential theme elements for the stories, similar to Rodari's "keys" of time and place (Rodari, 1996, p.51): a time or place, a character, a genre, a magical object or power.

⁵ The rules used were: The Choosing Rule: you choose which cards to use for your story map, The Numbers Rule: you must use the cards in the right order, The Pairs Rule: if you choose the first card of a pair you must choose the second card of that pair. Sessions were tried with and without each of these rules. The Pairs Rule refers to the pairs of functions identified by Propp, for which the second function always follows if the first function is found.

dictaphone was used to record participants' responses to emergent questions from the researcher. Participants were asked to explain their stories, asked about observations made by the researcher, or asked about their opinions of the story cards: what they liked or did not like, what they found easy or difficult. The researcher made paper and pencil notes of observations during each session which were written up at the end of each day. At the end of each session each participant's Propp cards containing the story written by the participant were collected.

Information about the school and its teaching methods for story writing was collected from the school's OFSTED report and interviews with the children and their teachers.

2.4 Analysis

The quantitative analysis focuses on one source of data: the written stories from the participants, and asks: how closely do the stories match the Propp functions of the cards used? To measure the accuracy of the stories, we developed a means of quantifying the written text. The problem was to find a consistent and reliable way of deriving the sequence of Propp functions from a story. The sequence could then be analysed quantitatively.

We developed an interpretation of Propp's functions that was more formal than the descriptions given by Propp. Because Propp's functions are highly abstract, identifying instances based on definitions of the functions is a difficult and interpretive analytical task. Instead we identify instances using the mid-level of abstraction given by Propp's groups, which lie between functions and concrete examples, related to the functions "as *species* to *genus*" (Propp, 1968, p.25). We developed an initial set of formal definitions of the species from Propp's work,⁶ then refined this interpretation based on examples in our data.⁷ We define an instance of a function as an instance of any species belonging to the function.

With this set of definitions as the materials for coding, we developed a process of analysis that produces results similar to the examples of completed analyses given by Propp (Propp, 1968, Chapter IX B and Appendix II) and also reflects the two-step process described by Rodari for reducing a tale to its abstract formula before recasting. It was found to be helpful to read a story from start to finish once to get an overview before beginning the analysis:

1. Reduce the writing on each Propp card to its bare plot events. Note which characters act in each event. This produces a plot synopsis of the story in which the events are connected to their Propp cards.
2. Considering this synopsis, decide which Propp role(s) are filled by each character. Knowledge of the roles of each character helps to identify the species, as roles form part of the definition of some species.
3. Decide which species each plot event instances. A plot event may instance zero-or-more species, and may instance multiple species of the same function or species of different functions.

From these steps the sequence of species, and therefore functions, contained in the story is derived, and each species is connected to the Propp card on which it is written. Given this data, quantitative analysis can finally be performed.

To measure the fit between the sequences of functions in the stories and the sequences of functions on the Propp cards two specific measures were used, a lower-bound (under-estimate) and an upper-bound (over-estimate). The lower-bound measure asks: how often is the function represented by a Propp card

⁶ For some functions we found that the species given by Propp do not lie at the correct, mid-level of abstraction between functions and concrete instances, but are much closer to the concrete level of instances or varieties of instances. For Levi-Strauss this inconsistency is the core weakness of Propp's morphology. Levi-Strauss criticised Propp for unwittingly reintroducing aspects of concrete content into his species categories, particularly in the twenty-two species of the crucial function *Villainy*: "A drawer filled with unclassified forms does not constitute a species" (Levi-Strauss, 1963, p.170). In such cases we group the species given by Propp under new, more abstract types, deriving a new set of species for the function at the most useful level of abstraction.

⁷ Where a clear example of a function appears in the data that does not conform to any of our species for the function, either a species was revised or a new species added to the function.

instanced on that card? This measure suffers from false negatives, as the story may contain the right sequence of functions without every function being on the right card. (For example, if the author has used one card to write several functions.)

The upper-bound measure asks: how often is the function represented by a Propp card instanced on any of the Propp cards of the story? This measure will count the instances missed by the lower-bound measure, but suffers from false positives because it does not account for the order of the sequences. (An anomalous instance of a function may be counted if it happens to match a card elsewhere in the story.) Both measures ignore additional functions instanced in a story that are not represented by any of the cards of the story.

These two simple measures provide lower- and upper-bounds and offer a good indication for the degree of fit between the sequences of functions represented by the Propp cards used and the sequences of functions implemented in the stories written.

3 Results & Discussion

3.1 How accurately did the participants recast the sample stories in week one?

The lower- and upper-bound accuracy measures were applied to 35 stories⁸ coded from week one (table 1 and figure 1). The majority of students were able to successfully recast the sample stories using the Propp cards (upper-bound mean 90.27%). The lower-bound measure is significantly lower (74.89%), and with greater variance, than the upper-bound.

3.2 How accurately did the participants construct stories in week two?

The lower- and upper-bound measures were applied to 35 stories coded from week two (table 1 and figure 1). Again, the stories fit the Propp cards accurately with only a few exceptions (upper-bound mean: 79.28%). The difference between the lower- and upper-bound is much smaller in week two than in week one.

In both weeks, no obvious pattern (age, sample story used, day or session, etc.) identifies the few participants with low accuracy measures. We note that with the exception of participant 111D the same participants have relatively low accuracy in both weeks. It seems probable that the difference is due to individual differences between the participants.

3.3 Why is the difference between the lower- and upper-bounds larger in week one than in week two?

Many of the week one data show a large difference between their lower- and upper-bound measures. The mean difference between the lower- and upper-bound measure of each story in week one is 15.38% (standard deviation 10.6%). But in week two this

	Lower-bound		Upper-bound	
	Mean	Standard deviation	Mean	Standard deviation
Week On (recasting)	74.89%	18.74%	90.27%	13.35%
Week Two (generating)	74.49%	17.99%	79.28%	16.76%

Table 1: Mean per-participant accuracy measures, both weeks.

⁸ Of 42 participants in week one, 35 stories were coded. 7 more stories were marked as compromised because they could not be accurately coded. No stories were compromised in week two.

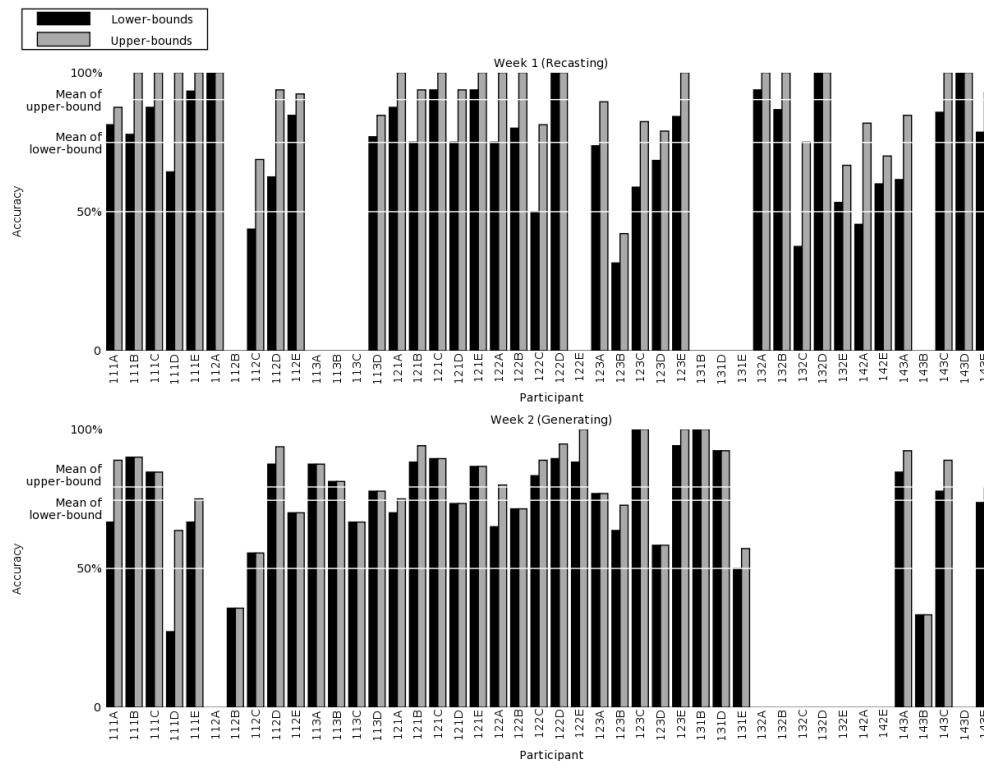


Figure 1: Lower- and upper-bound accuracy measures per participant, week one against week two.

difference is much smaller, the mean being 4.79% (standard deviation 7.63%). During the study participants were often observed writing two or three correct functions on a single Propp card, and then leaving the next one or two cards blank when they realised their mistake. The story 'runs ahead' of the story cards. In these instances the story contains the correct functions (and in the correct sequence) and they will be counted by the upper-bound measure, but because the functions are not on the right cards they will not be counted by the lower-bound measure. Our hypothesis is that these run-aheads occurred frequently in week one but not in week two, causing the lower-bound accuracy measures in week one to suffer.

To test this hypothesis, a run-ahead is counted wherever a participant has failed to implement a function on the correct card, but has implemented the function on either one of the previous two cards. By this definition 62 run-aheads occur in week one, 14 in week two.

If we add the run-aheads to the lower-bound count of each story in both weeks the differences between the lower- and upper-bounds shrink, to a mean of 3.3% in week one and 1.96% in week two (variances 5.7% and 3.55%). When run-aheads are added to the lower-bound measures, the mean for week one increases from 74.89% to 86.96%. The mean from week two changes little, from 74.49% to 77.32%.

A quantitative analysis of the types of run-ahead shows that run-aheads occur most often when certain pairs of Propp cards appear in sequence in a story map, and that these sequences appear more often in the story maps from week one than in those from week two. Our hypothesis is that run-aheads occur because the author is thinking about the sample story that they are recasting, particularly at points where events are closely related one event in the sample story brings the next to mind and both are recast on the same card. Because the participants were not recasting in week two run-aheads were less frequent.

When run-aheads are added to the lower-bound counts, the means of both the lower- and the upper-bounds are about 10% higher when recasting stories than when generating stories. Although the generated stories have lower accuracy than the recast ones, the results from week two appear to confirm that children can accurately use the Propp cards to generate stories from their own story maps as well as to

recast stories. But this conclusion rests on the assumption that the participants were constructing original stories in week two. The participants may instead have attempted to recast the sample stories from week one again, from memory, with slightly less accurate results than when the sample story was more fresh in their minds. A quantitative comparison of the cards used by each participant in week one and week two can only give an indication. Without taking order into account, 64% of cards chosen by participants in week two were used by the same participant in week one, but the overlap may be due to deliberate behaviour by the participant or it may be a feature of the Propp functions that some are more useful than others. Qualitative analysis will be needed to assess how much the first week's sessions affected the results from the second week.

3.4 Were some functions recast more accurately than others?

To answer this question the lower- and upper-bound accuracy measures were applied to each function (figure 2 top). When assessing these results the sample stories that were recast need to be taken into account. The instances of the functions in these stories acted as examples from which the participants recast the functions. The frequency of use of each function reflects the functions of the sample stories that were used. The difficulty of recasting of course varies depending on the story being recast. Not only did the sample stories used vary in complexity, but during the study it became apparent that two of the sample stories did not make very clean-cut use of some of the functions. As a result these two sample stories were used less frequently, and the remaining, clear story was used more often.

The lower-bound accuracy measures for many functions are much lower than the upper-bounds, because these functions were victims of run-aheads. Considering the upper-bound measures, a group of functions has both high accuracy and a high frequency of use (from left to right, Initial Situation to Pursuit). These turn out to be exactly the functions of the clearest sample story. We can conclude that, given a clear example of their use,

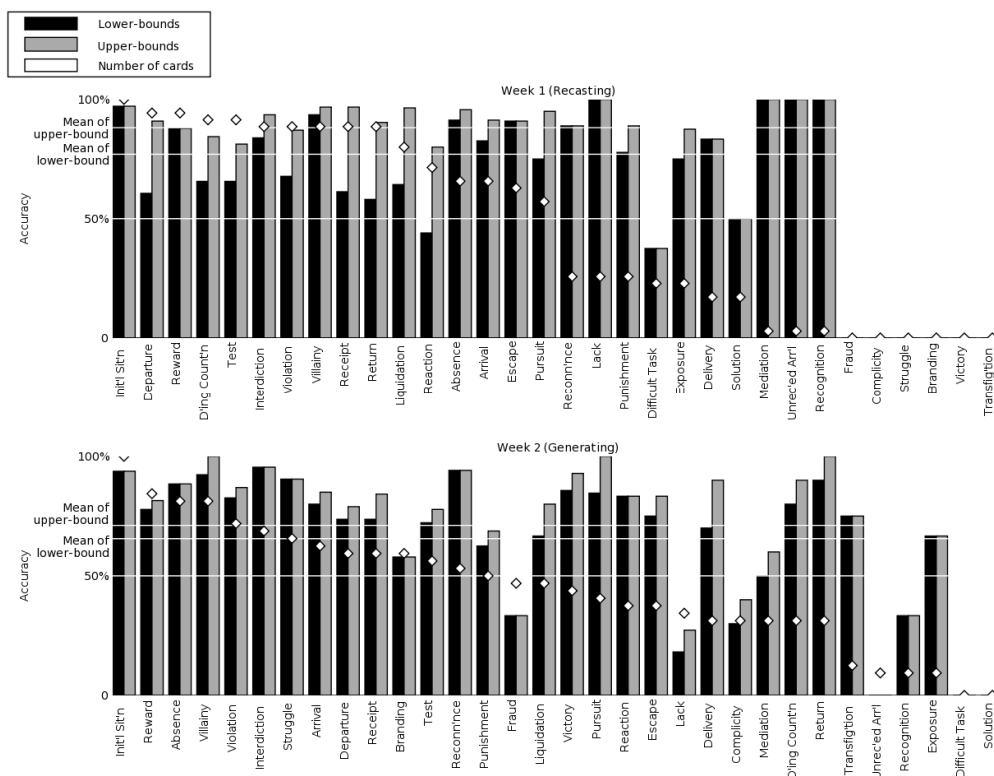


Figure 2: Lower- and upper-bound accuracy measures per function, week one against week two.

The diamonds show the number of times each function was used on a scale of 0-35 (week 1) and 0-32 (week 2).

children can recast these functions reliably and accurately. No frequently used function has a low accuracy.

The remaining functions are those that appear in one or both of the less clear sample stories but not the clearest one. Because the frequency of use of these functions is low we cannot place too much confidence in these results, but we note that all have high accuracy except Difficult Task and Solution which measure 37.5% and 50% respectively. Even without the low frequency of use, a clear conclusion could not be drawn about a function that measured low accuracy when recast from just one or two sample stories. Blame may lie with the function itself, or with an unclear example in the sample story.

3.5 Were some functions used more accurately than others when generating stories?

In week two the lower-bound measures for each function follow the upper-bound measures closely (figure 2 bottom), but the upper-bound measures are more variable than in week one. The frequency of use of each function in week two reflects how popular the function was with the participants. Again there is a group of functions with high accuracy and high frequency. These are the same functions as in week one, with the addition of Struggle and Reconnaissance. Fraud and to a lesser extent Branding stand out as functions with a high frequency of use and low accuracy. Otherwise, functions with low accuracy have low frequency, as in week one.

4 Conclusion

The quantitative results verify that children are able to successfully recast stories using Propp's morphology: with few exceptions participants' stories implemented the correct functions. The same result appears to hold also for the process of generating stories using Propp's morphology, but qualitative analysis is needed to determine to what extent participants were generating new stories or repeating their recasting of the sample stories from earlier in the study. Quantitative measures do not capture the quality of the stories. It will be interesting to see how the accuracy of the stories coincides with the degree of originality and personalisation.

Further analysis will combine the quantitative results with qualitative observations and examples from the data to identify how participants use the tool. When discussed together these aspects will give context to each other and present a more thorough picture of the study.

The work so far verifies the model as a story writing tool for children, and illustrates a methodology for testing the model. Based on the experience of the study and further analysis of the data, the next step will be to develop a more formal model to be implemented in a computational tool, and to develop our methodology to test the implementation.

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Shakespeare the Impartial Storyteller

Brian Lighthill

In this active session I want to explore how Shakespeare's stories can be used as a tool with which to teach Personal, Social and Citizenship education (abbreviated to PSE) to middle-school learners, and suggest that the stories can promote self-reflection which, after all, is at the epistemological heart of Citizenry education.

My research is a mutually beneficial transdisciplinary exercise which forms the basis of my four year Action Research in a Warwickshire school situated, coincidentally, a mere six miles from Shakespeare's birth place - Stratford-upon-Avon.

My exploration is on whether the sensitive topics being aired in PSE lessons - relationships, racism, community, religious intolerance, bullying, human rights, democracy, wars, social welfare, governance - can be explored through Socratic discussion on the journeys taken by dramatic persona in selected Shakespearean stories, and through analysis of said journeys, students empathetically develop citizenry awareness and, at one and the same time, discover that the ideas, themes and issues in the plays are as relevant today as they were four hundred years ago.

The storyteller, as an impartial facilitator, is not only a community's link with the past but it is also a connection with the future - empowering listeners/learners to observe the 'I-now' which 'perceives 'I-before' and has a presentment of a 'possible-I' - a 'future-I' (Boal, 1995). This process empowers learners to becoming storytellers of their own lives (Zippe, 1995) in order that they can determine their own and our destinies.

Arguably there is a need - an imperative - to develop a http://en.wikipedia.org/wiki/Social_contract social contract between 'others' - based on the principles of justice engendering cooperation.

Rawls (1971) argued that people are neither saintly altruists nor greedy egoists but rational and reasonable; they have ends they want to achieve, but are happy to achieve them together if possible in accord with mutually acceptable principles in a global community.

Developing the ability in young learners to philosophies on this paradigm is the primary objective of my research.

Creative Learning by Designing Digital Board Games: Practicing deep reading skills through game creation process

Sanna-Mari Tikka, Tuula Nousiainen and Marja Kankaanranta

Abstract

This paper discusses the educational process of students' game creation, focusing on the game design step. The paper considers a use experiment that was realised by using Narrative Talarius, a tool by which one can create and play digital board games. If desired, one can create narrative structures for the board games through the multiple functions of the tool. The focus of the paper is on the pupils' game design process and content decisions from the viewpoint of the game narratives. The pupils designed the games within a literary text subject. Thus, this experiment was realised within the field of children's literature studies, and so the paper also touches a bit on children's practical training of deep reading.

1 Introduction

The use experiment discussed in this paper was conducted by using a new learning tool called Narrative Talarius, developed at the Agora Game Lab, University of Jyväskylä. With Narrative Talarius, one can create his own digital board games and play them with friends. For a teacher, Narrative Talarius also provides the possibility to observe log-information about each playing session. The idea behind Narrative Talarius is that, in the process of designing his own board games, a student demonstrates her knowledge about the theme of the game and comprehension of the overall subject matter.

Game playing can be an educational experience, which has already been discussed by many researchers. Gee's *What Video Games Have to Teach us About Learning and Literacy* (2003) is one of the most cited, recent texts in this domain. Furthermore, game creation and its effects on learning have already been observed by some researchers (e.g., Kafai 1998, 2006). Kafai (2006) reviews the use of computer games for learning from two pedagogical perspectives, instructionist and constructionist. Instructionism deals with educational games that, in most cases, integrate the game idea with the content to be learned (Kafai 2006, 37). On the other hand, the constructivist perspective highlights the value of a game creation approach, which allows students to learn and examine knowledge through a creative process. Researchers also have been discussing, for example, the kind of motivational and learning affordances inherent in the game creation process (Good and Robertson 2006) and how the game creation process can develop one's narrative skills (Robertson and Good 2004; Szafron et al 2005). The cases these researchers are addressing are mainly games that belong to the three-dimensional presentation genre. However, the games studied in this paper belong to the computer game genre of board games.

The discussion related to computer game playing and literacy learning is wide-ranging. However, due to the space limitations, the topic of this paper will focus only on pupils' content decisions from the viewpoint of the game narratives and with relation to the source novel. In the context of this paper, the concept of deep literacy means that the pupil not only reads a text in a mechanical way, but he also ponders and interprets the text. So-called game literacy¹ needed during the game creation process is considered in another paper also addressing on this use experiment².

The connections and content exchange between computer games and other media have evoked discussion. Two quite distinct viewpoints regarding adaptation have been articulated, one by Juul (2001) and the other by Jenkins (2004). From Juul's perspective, computer games cannot include the same narrative as the sources belonging to more traditional storytelling media, and thus cannot be adaptations

¹ See more on game literacy from Buckingham, D. and Burn, A. (2007). "Game Literacy in Theory and Practice".

² This article will appear in Thomas Connolly et. al. (eds.) coming book *Games-Based Learning Advancements for Multisensory Human Computer Interfaces: Techniques and Effective Practices*.

(Juul 2001). Jenkins approaches the adaptation more widely—and probably in a more contemporary way—saying that computer game adaptations have the possibility to extend our experience of some particular story by using the particular capacity and means of expression of computer games (Jenkins 2004, 677-678). In addition, multimediality, cross-media stories, and their effects and requirements also have been discussed (e.g. Burn 2005). In this paper, the games considered are related to adaptations in two perspectives: Games made by Narrative Talarius are adaptations of tangible board games, and, due to the fiction-related theme of the use experiment, the games could also be seen as partial adaptations of literary work.

While this paper discusses game narratives, there are different ways in which narrativity can follow from the computer game. According to Salen and Zimmerman (2003, 383), a player can experience a game narrative in two ways. First, a game narrative can be an interactively told story that a game designer has constructed in advance during the design work. Second, a story can be an emergent experience that occurs during the game play. These are named by LeBlanc as embedded and emergent narratives, respectively (Salen & Zimmerman 2003, 383). These concepts will be used in this paper when the narratives created by the pupils are discussed.

2 Talarius and Narrative Talarius

Talarius (in Latin “having to do with dice or dice-playing”) is a software application with which one can create and play computer-based board games. Talarius allows the user not only to create a game board, characters, and questions for the question squares, but also to play the games created by others. The application is not content-specific, hence the topics of the games relate to any school subject or topic area, as well as to more informal learning tasks. Talarius aims to encourage collaboration and, in addition to learning content-specific knowledge, to improve the development of social interaction skills, problem-solving skills, decision-making skills, and basic computer skills.

In the process of creating a game, the student must examine the learning subject, make decisions, and create something meaningful with the aid of technology: becoming producer rather than a mere consumer of a game designed by someone else. Thus, the goals of the Talarius software application are related to both the instructionist and constructionist approach. In order to make a game for his classmates to play, a pupil must understand the subject matter of the learning well enough to identify what about it is essential to include in the game. Then he must formulate questions and tasks on the topic, which adds to the potential of developing information searching skills and the ability to assess the quality of information sources. As mentioned above, team working and collaboration skills are important learning opportunities related to the basic idea of Talarius. Game making and playing in groups require that pupils have to express their thoughts to others and to listen and respond to others’ ideas, thereby making their thinking visible to themselves and to others.

Narrative Talarius is the latest version of the software. In this phase, the potential for storytelling was the specific target for development. Therefore, a model was constructed that integrated on the one hand the abstract structure of a game (the model of MDA³ from Hunicke et. al. 2004), and on the other hand, of narratives, principally basing on different guidebooks and theories on drama creation and game design. The development of Narrative Talarius was based on this model (Nevala 2007). Within the development process, a variety of functions for creating story elements have been implemented. Narrative Talarius allows the possibility to create playable characters, meaning these characters can express themselves during the game play through an avatar picture and a back story. A player can read the story at the beginning of the game play, when choosing his character from the list of potential characters. The characters also have characteristics that can have an effect on the playing, especially on the events of a game. During the creation of the game board, multiple possibilities exist for building in different events or objects for the story content. For example, games can include hidden or visible items on the route of the board, or areas can require some item or other characteristics from the player’s character before he

³ The model of MDA is standing for Mechanics, Dynamics, and Aesthetics model.

can move ahead. The events that transpire can affect, for example, the player's points, character feature values, or the turn taking of the player or all players.

For creating storytelling contents, these functions can be implemented in multiple ways. In many respects, the story creation possibilities in Narrative Talarius board games are comparable to those of actual role playing board games. However, in line with the adaptations perspectives, the transition of literary elements into a digital medium of computer games also naturally brings about differences.

3 The Use Experiment in the Field of Literature and Deep Reading

In the use experiment, the primary aim was to discover how Narrative Talarius lends itself to academic learning and, in this particular case, to the context of literature study and deep-reading practices. As the new narrative functions were in use for the first time, the research questions were directed towards the usability, benefits, and problems related to them. The research questions were how are the tools for narrative creation utilized, how is the narrativity of the games designed, and, how does the narrativity work in the games and support the learning? The use experiment was realised with a class of twenty-one 9-year-old pupils at a local primary school, who were divided into five game-making groups. The theme of the learning was a literary work, Astrid Lindgren's novel *Ronja, ryövärintytär*⁴. This topic was more or less familiar to the children because the teacher had read the book to the class during the autumn semester. Some of the children had also seen the movie based on the novel.

While Narrative Talarius has the potential for creating narrativity into games and the theme itself was "storyable", it was presupposed that the pupils would be motivated on their own to construct some kind of story within the games. Strictly speaking, the task given to the pupils did not include the requirement of story creation. They were only asked to design and realise a game related to a certain setting in the source novel. Thus, ultimately the students received an opportunity to choose the own way to consider the subject through their game creation.

The main aims of the task were to get the children to acquaint themselves with the book and develop their story construction and deep reading skills by creative action. The pupils worked in small groups. Students got topics that referred to a specific setting in the book. In the process of designing the game, the students first prepared mind maps about the background information related to their topic. Then they designed and scripted their board games by drawing and using forms that were in line with the user interface of Narrative Talarius. Next, the scripts were realised by Narrative Talarius. At the end of the game making stage, the students were interviewed. In the second stage of the user experiment, the topics of the original games were reassigned to other small groups, and pupils made mind maps about their new topics. Next each group played the new-topic game that was made by their classmates during the first stage of the study. At the end of game play, the pupils were able to make alterations with coloured pencils to mind maps they previously had created for their new-topic games. Following this process, the students were interviewed again.

We gathered a broad selection of materials as data from the use experiment: mind maps, scripts, prepared board games, observational notes, videotaped interviews and log-information. These materials were analyzed using a qualitative data-driven analysis method.

4 About the Narrative Game Design by Narrative Talarius

4.1. Contentual Relationships and Decisions

The pupils' task was not to retell a part of the novel through their games. The games were attached to the source novel principally because of their setting-based relation, but they did not reproduce the events related to the settings as such. Still, the episodes that emerged during game play can be seen as relating to the events of the sourcebook. For example, one of the pupils' games, Bear's Cave, can be seen as an

⁴ *Ronia - The Robber's Daughter*, original work Ronja Rövardotter.

alternative episode for a particular part of the source novel, while another game, Matt's Wood, appeared to be supplementary detail for a portion of the story that had been narrated in a compacted form of expression.

However, the pupils designing the Matt's Wood game were building up a story, which constitutes a background and motivates the player to execute the main task of the game. The designed story tells that the mother fox had lost its whelp and asks now the player to find it and to take it to the den. This back-story for the game is independent in relation to the sourcebook in the sense that it does not have to be completed with the sourcebook in order to understand it. Still, the back-story utilizes the content of the novel, so that a reader can replenish his knowledge about this opening situation by reading the parts of the text that explain how Ronia (the main character in the book) had been watching the fox family since the whelps were born (Lindgren 1981, 55). At first, Ronia did not like the idea that Birk Borkason (another character in the book) also would be watching them, because she thought, through her own logic, that the foxes were her own (Lindgren 1981, 55–56). Still, the commentary of the mother fox, which is not part of the original story but rather designed explicitly for the game, refers to several persons—on the contentual level these could be perhaps both Ronia and Birk, and on the practical level, the players. Thus, the mission played through the game, and the event it constitutes, are easier to situate imaginatively within some later text of the novel, where the foxes are no longer mentioned, but where Ronia and Birk have become friends and they spend a great deal of time together in the forest. In this case, the designed back-story works as an embedded initial situation and the later potential of the story will appear as an emergent experience.

The pupils who designed the game called Matt's Fort created a situation that somewhat resembles a few scenes in the source novel. The initial situation of the game is that the player is inside a castle and he has to find a key to get out. In the book, there are two scenes in which Ronia is inside the castle and wants to get out, but there lies some kind of obstacle or tension related to that desire. In the first case, the obstacle is nature: It is winter and there is so much snow outside that Ronia cannot get outside (Lindgren 1981, 88). This is quite an everyday situation. Only getting bored and missing Birk needle Ronia. In the other case Ronia plans to run away from the home castle during the night. Although she is sad and feels compassion for her mother, she still leaves in order to live together with Birk.

In the book, there is no such scene where Ronia would look for a key to leave her home castle; there also is no situation where someone wants to forestall her leaving. Her home life in the castle is described many times as happy and warm. Even, when the relationship between Ronia and her father tightens, Ronia can still go outside if she wants. However, the book relates a tension between being outside and inside the home castle—a castle that has been split in half, imagery that also mirrors the basic theme and tension of the book. The tension sets between the Matt's group and the Borka's group as well as children and adults. In the design of the Matt's Fort game, the pupils have especially dealt with the tension between children and adults. They have intensified the configuration and set a possibility for the player to defuse this tension. The narrative of this game is more emerging than embedded, for there is no kind of constant story structure designed in the game. The narrative emerges more from the relationship between the tensions of the source novel and the basic situation in the game. It is possible that a player does not notice this tension at all during the game play, and it is not requisite for the game playing either.

In the game called Robbers' Walk, the pupils did not build any particular narrative structures. Their realization of the task was more about game-like exploration while they transferred the essence of the setting into the main idea of their game. In the novel it is told that the Robbers' Walk is a place where robbers steal from travellers (Lindgren 1981, 16). The pupils transferred this content as a main goal of their game: During the game, the players must collect as much points as possible. Along the game path, two hidden treasure chests give players points, but first the players must find the keys for the chests. Players also can earn points by answering correctly the questions posed at the question-spots. Finally, players can gain points by stealing other players' points. In the book it is told that the robbers steal from travellers, but also from other robbers, when there is nothing else to steal (Lindgren 1981, 16).

Thus, this detail also is motivated by the source novel. In this game, the storytelling is emergent during the game play instead of being embedded within the story structures.

4.2. Defining Challenges

In this section, the problematic areas of the game design are observed from the viewpoint of the pupils. During the use experiment, some challenges from the viewpoint of the teacher also were noted. However, they are not considered within the limits of this paper.

Problematic areas of the pupils' game design were related to game realization and the software. Problems related to realization were rare and seemed to arise from the hurry the pupils experienced at the end of the game design period. The problems related to software concerned some of the functions of Narrative Talarius that the pupils partly or fully did not understand. These problems came up during the design step because the approach of the forms used as aids for scripting was programme-based. Poorly understood functions included the event building and the character feature values. In the case of events, problems appeared regarding the completeness and functionality of the events. The design of events requires exactness for all details and ability to imagine the game event in order to deduce the kind of issues a pupil should take into account in its designing. The problems related to the creation of events also could be a consequence of the lack of iterative testing stages during the game creation process. In this experiment, the pupils were testing their games only at the final stage of game creation. As a consequence, some games were a bit insufficient due to the faulty design of the events.

The function that absolutely seemed to be the most difficult one for the pupils to understand was the values of the character features. This function not only describes a character, but is also related to the certain mechanics of board game made by Narrative Talarius. This function should be designed in conjunction with the intended events. For example, when characters are allowed to steal points from each other, the value of the feature that defines activeness of the characters has an influence on the probability that the particular character carries out the attempt. The pupils used the values of the character features first as a means for describing the character. Later some groups left the values out or relocated the intended description to the separate array meant for the back-story of the character. The function of the characters features was perhaps too difficult and abstract to understand for these young children. Another explanation could be that the general introduction to event making was not explicit enough.

4.3. The Deep Reading through Game Creation

Most pupils were reading the book during the game design step, and it seemed that they were looking for facts for the series of questions. In the cases where the pupils, at the start of the project, did not know enough about their topic, a particular setting of the novel, their question writing seemed to serve the purpose of constructing a definition of the place. However, from the viewpoint of the exercise of literature studies, the time limits constituted a significant problem. Because the pupils did not have sufficient time to go through the book during the game design step, they went by their memories or did not question even the wrong notions.

During the question making, the pupils charted factual details related to the content of the novel. It became clear, however, that they were not inclined to handle any questions with interpretative content, even though they would not have needed to define "the right answers" if they had used open-ended questions. On the contrary, the pupils seemed to like making multiple choice questions, where one of the alternatives had to be defined as the right answer.

Regarding the creation of the boards, the pupils discussed the appearance or landscape of the setting. They constructed their reading through drawings and route making. This construction was built up also by determining the main idea and the goals of the game, and by creating the events on the board. Finally, during the character design, the pupils represented their mental pictures of the characters of the novel by drawing them and using descriptive words.

While the pupils designed the game ideas as a whole, they proved to hold several media literacy skills. By these skills pupils utilised the context of digital board games to investigate the world of the literary text.

5 Conclusions

The results of the use experiment, addressed here particularly from the viewpoint of the pupils' digital board game design processes, demonstrate that such an exploratory approach toward deep reading is challenging, but conceivable. The scripts, the games, and the interviews also indicate that, during the game creation process, the pupils constructed and compared various interpretations related to the source novel. The narrative functions were utilized for creating back-stories that served as a starting point for a game, for describing the characters, and for illustrating the progress of the game—as well as the possible emerging storiness—by creating events on the game board.

The challenging nature of the game design process in the use experiment described in this paper is explicable, on the one hand, by the lack of iterative testing steps by the children during the game design process. On the other hand, the pupils had to deal with multiple and simultaneous learning goals during the game design steps. The game design steps required the pupils to practice, for example, deep reading, game designing, storytelling by way of a board game, and collaboration skills. Still, almost all of the pupils said in the interviews that the game creation was welcome and pleasant change to basic teaching methods.

Further research into the application of the Narrative Talarius for such learning goals is needed. For example, the teacher's viewpoint, the design method, and the instructions and guidance are just some to consider. Nevertheless, the data point to obvious benefits in this kind of deep reading practice for both the teacher and the students having opportunities to develop more extensive skills in new forms of literacy related to multi- and intermedial storytelling.

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Empowering Children as Participants in Designing Resilience Strengthening Online Tools

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Extended Abstract

Over the past decade, an increased focus on the mental health of children (World Health Organisation report 2001) has seen a growth in programs that promote the positive mental health and well-being of young people. A priority area is resilience, which can be described in broad terms as, “the capacity of individuals, schools, families and communities to cope successfully with everyday challenges including life transitions, times of cumulative stresses and significant adversity or risk.” (Stewart, Sun & Hardie 2006, 37). The capacity of individuals to face adversity and to ‘bounce back’ can be attributed to a range of protective factors. These factors contribute to resilience by establishing a positive self-image, reducing the effect of risk factors, and opening up opportunities for growth (Gunnestad 2006). Importantly, the protective factors can be strengthened through education. This provides an opportunity for educational intervention to increase awareness and bring about behavioural change. Various resilience-promoting educational initiatives have been developed internationally and within Australia, however, few have considered digital technologies as a viable medium for children’s mental health promoting initiatives.

As young people have increasingly taken up digital communication to gather information, explore ideas, and support their social interaction, the capacity of digital media and online environments to augment such activities is becoming apparent. As Mia Lustria has argued, the Internet has the potential to become a powerful health communication tool (Lustria 2005, 2) and, as researchers in the field of mental health promotion have argued, “[the field of Visual and Interaction Design is potentially] a major contributor to positive mental health initiatives for children and young people” (Stewart, Sun & Hardie 2006, 79). Games, quizzes and online activities have been produced with various mental health promotion goals, including developing emotional intelligence; encouraging participation in school communities; building social skills in communication, truth-telling, and responsibility; promoting strategies for coping with bullying; and encouraging physical health.

Visual and interaction design plays a vital role in shaping online mental health promoting educational tools because it determines their appeal, levels of engagement and, ultimately, their uptake. Visual and interaction design is therefore a major determining factor in their efficacy. Yet the potential of digital communication in this field is yet to be fully exploited. An initial survey of the field has established that, while they may draw upon the principles of visual and interaction design to engage users, so far the majority of online resilience-promoting activities simply replicate offline activities in digital form. By and large, they do not embrace the potential of the electronic medium such as the alternative forms of modality, communication, interaction and engagement afforded by computer-mediated environments (Zelenko, 2006).

Research is needed to identify principles and guidelines for the design of online mental health education and promotion initiatives (Lustria 2005; Stewart Sun & Hardie 2006, Zelenko 2006). Questions revolve around appropriate aesthetic, visual and interaction design principles, as well as how the unique modalities at play in online environments can be harnessed to increase children’s engagement with, and assimilation of, health-related information. And, while the outcomes of offline mental health-promoting activities have been subject to rigorous analysis, as yet no explicit evaluation

has been published on the effectiveness of most resilience-promoting online tools. Research so far tends to point to broader research into the effects of electronic play (by, for example, Solonious-Pasternak and Gelford, 2005), rather than the impact of such tools on users in terms of health outcomes (Lustria 2004, Rice & Katz 2001).

Moreover, while the (largely ethnographic action research) methodologies of designing offline resilience-promoting projects have been interrogated and refined to suit the context and goals of resilience-building interventions, the design methodologies for online tools have not yet been subject to the same level of scrutiny. Analysis has tended to focus on technical aspects of implementation (such as storing data, user information, queuing and security). The design of health education tools is typically approached as a collaboration between content experts – health educators, psychologists and social workers – and IT specialists, with educational specialists and instructional designers acting as intermediaries between content production and systems delivery through input into interface and interaction design. Together, this group of experts define the content and goals of the tools and guide the experience of the user. Research is needed into alternative methods for optimising interaction and engagement of children, which might better facilitate the goals of developing their resilience.

The *QUT Visualising Resilience Project* is conducting research into effective interaction and visual design in online, resilience-promoting tools. It is also adopting an experimental design methodology entitled Participatory Design. A group of children, of the same age and social background of the target audience for resilience-building tools, has been recruited to contribute to the design process. As co-designers, they have been involved in both defining resilience and designing the goals and user experience of the tools. The input of the children to the design process has contributed to the final design of the online tools, and it is our long-term goal to investigate whether this user-led approach to interaction design will influence the uptake, engagement and efficacy of the tools. In the meantime, as the project has unfolded, an additional outcome of the Participatory Design process has emerged. The children involved in the project have reported a greater understanding of, and capacity for, resilience through their participation in the design workshops. This suggests that the Participatory Design process has produced an outcome beyond the value it might add to the tools themselves. That is, involvement in participatory design has a powerful educative potential in itself.

In this paper, we will present the *QUT Visualising Resilience Project's* participatory design methodology as a case study. We will outline its mixed, multi-method approach and the creative workshops that are at its heart. And, while we will discuss how it has contributed to the online interactive tools, we will focus on the outcomes of the design process itself for the children involved. We will argue that, as participant designers, children can not only contribute effectively to the design process, but that participation in itself can achieve significant benefits for the young designers.

Inspired Storytelling: the Digital Re-tellings of a Traditional Tale

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Abstract

Narrative and technology in education traditionally takes the form of tools designed to facilitate story-making in engaging and novel ways. This paper describes a teaching project which explores the reverse of this conventional approach. That is, what happens when you provide burgeoning designers with the creative catalyst of a traditional folktale and ask them to re-tell it digitally? By giving learners the same core story and leaving the medium of digital representation open, they are able to fully develop their creative skills and create unique, personal interpretations of the story. In order for learners to benefit fully from this experience, they require an awareness of the culture of storytelling and a range of technical skills. In the example described in this paper, the learners were undergraduate Interactive Media Design students from the University of Dundee and already equipped with the necessary technical abilities, the teaching focus was on exposing them to the culture of practising traditional storytellers. This method of combining narrative and technology supports a learner-centred approach encouraging students to engage with core and emerging ideas of story and storytelling.

1 Introduction

Storytelling can be used as an inspirational tool; a creative catalyst to generate exciting new forms of multimedia. At its heart, storytelling is a basic human need, common to all cultures, presenting itself in easily understood and accessible ways (think anecdotes, films, gossip and jokes as well as more formal types of storytelling). In this research, traditional oral storytelling was re-introduced to young adults (20-21 year olds) with a modern twist; the combination of traditional telling and digital media.

It is important to note the scope of this study was not to suggest ways to supplant traditional storytelling, rather it was to bring story to the fore by casting it in a central role, as a starting point and reference. Similarly, the aim of the project was not to create traditional storytellers out of the participants, nor to prescribe ways of dealing with traditional tales digitally, but to encourage freedom of expression and facilitate the creation of novel, engaging digital experiences from the inspiration of a tale.

2 Contextual background

2.1 Story

Story making and telling is a fundamental life skill[1] and is practised in some form in all walks of life. In terms of this paper, 'storytelling' is taken to refer to the traditional live performance of someone telling a story face-to-face to one or more people (that is *telling* a story, not reading or reciting verbatim).

The fundamental concept underlying this research is the seemingly conflicting nature of oral story, being both ephemeral and enduring. Ephemeral in that it is only the unique performative moment of telling a story that the story can be truly said to exist and enduring, so that in the act of telling, the story passes from the individual to the group of listeners, enabling them to retell the story themselves.

2.2 Storytelling Characteristics

There are several qualities that characterise oral storytelling and can be considered as distinct from story content. It was hoped that some of these properties would be independently identified and transposed to the digital realm by the learners;

- Diversity (*both of stories and storytelling styles*)
- Collective memory¹ (*the knowledge and sharing of stories in a group of tellers and listeners*)
- Performance (*a live event with audience/listeners. Good listening encourages and creates good storytellers*)
- Uniqueness or malleability of performance and story (*ability to tailor story to the listeners*)
- Physicality of storyteller (*the presence of teller in front of the listeners coupled with the power of eye contact*)
- Voice (*the power of voice and language to evoke mental images of the story through imagination of the listener*)
- Gesture and body language of storyteller
- Personal connection with story (*emotional reactions or mood for both teller and listener is dependent on their experience and personal interpretations of the story*)

2.3 Digital Storytelling

Digital storytelling is narrowly defined as a short, personal multimedia film. The personal anecdotal aspect is critical, with the teller using their own material to illustrate, script and narrate the story. The multimedia element is generally limited to audio narrated slideshows². Digital storytelling was heavily influenced by the work of American artist Dana Winslow Atchley III³ who wanted to be able to trigger memories and find a way to bring new media forms and people together. Similarly, Daniel Meadows⁴ tries to show how technology can break barriers and facilitate the sharing of stories. A good digital storytelling experience requires three components; a strong story (i.e. the best version of the story that author can possibly produce), transferable skills (e.g. learning technology) and clear storyteller ownership. The cathartic process of creating the story is incredibly important and can often represent a substantial achievement for the teller, both by expressing something very dear to them and in the achievement of mastering the technological skills to create it.

2.4 Technology & Storytelling

Interactive Digital Storytelling draws extensively on the fields of narratology and contemporary storytelling (e.g. television and film) to inform the design of interactive, user-led and generated digital narratives[2]. There is considerable emphasis on plot structure and the integration of intelligent agents through software algorithms, but the main applications are still largely screen-based.

Narrative and technology in education traditionally takes the form of tools designed to facilitate story-making in engaging and novel ways, for example physical programming in the form of storyrooms[4] and Adventure Author[7].

However, in these technology-enhanced storytellings, users are presented with technology and invited to create and explore stories. In the research example presented in this paper the reverse is true – participants are given the story and invited to create and explore technology.

3 The Re-telling

3.1 Students

The ‘Retelling’ module took place in the second semester of 2007-08 with 23 third year Interactive Media Design students at the University of Dundee. This interdisciplinary course gives students grounding in computing and design so they already possess the prerequisite background of technical skills, creative thinking tools (e.g. mindmapping) and design processes. In order to use a tool effectively (especially in a

¹ Diversity, malleability and collective memory also characterise orality in more general terms[5].

² For example, see the many examples at BBC project Capture Wales at <http://www.bbc.co.uk/wales/audiovideo/sites/galleries/pages/capturewales.shtml>

³ <http://www.nextexit.com/>

⁴ <http://www.photobus.co.uk/>

creative context) the user must have awareness of what the possibilities are and be able to correlate this with their aspirations to generate realistic goals.

3.2 The Story

The story for the main assignment was the traditional Scottish tale of ‘Willie the Piper and the Frozen Boots’ (many versions exist and it is variously known as ‘The Boy and the Boots’ and ‘The Cow that Ate the Piper’[3,6,8].) This story was chosen for several reasons, partly because of the opportunities it allowed in reinterpretation in terms of genres and because of the dark aspects to the tale; the Scottish setting; and its structure (which was robust enough to allow simplification and elaboration as required).

3.3 Aims

The aims of the teaching project were to;

- encourage independent learning
- develop critical reflection skills to inform students’ future work
- give students an insight into the culture of storytelling through participating in and observing oral storytelling
- allow students to explore fundamental aspects of storytelling
- give students a real world opportunity to practice user centred design techniques (through strong links with the local storytelling community)

3.4 Module Progression

The module was kick-started by an evening of storytelling led by a local Scottish traveller and supported by other local storytellers. This was the first time that many of the students had experienced ‘storytelling’ and it was a powerful way to introduce the strengths and diversity of stories and storytelling in a natural environment.

The initial teaching focus took the form of hands-on workshops, which were deliberately constructed as largely ‘low-tech’ experiences to encourage students to engage with the concepts and practice of storytelling and listening. These workshops were supported by significant input from the Scottish storytelling community; visiting storytellers helped not only in a practical ‘how to tell a story’ manner but by explaining characteristics and culture of telling. After this intensive immersion into the world of storytelling, students were asked to develop their response to the main brief and were given space to develop and produce their work. The networks of peers and staff, along with regular drop-in sessions, provided supplementary support for students. Throughout the module, students were actively encouraged to critically reflect on their own work and their peers through an online blog system. Peer review sessions were a key part of the reflection process and a reflective workshop was run near the end of the module to help students prepare for their presentation. Assessment was in the form of initial concept pitches and final presentations and demonstrations of their work. The module culminated in a mini-festival (‘Timeless Tales’) where the students presented their work to friends and family. This festival revealed a rich tapestry of hybridised digital-storytellings, highlighting the extent to which students had connected with the ideas surrounding storytelling.

4 Timeless Tales

Students took two main approaches to the project focusing either on the story or the medium. Students concentrating on the story used predominantly traditional visual media (e.g. animation, video, illustration) and worked on redeveloping and scripting the story (e.g. resetting the story in a modern environment). In the medium dominated approach, students tended to retain the original context of the story and instead tried to address an attribute of traditional storytelling (including those outlined in section 2.2) to produce a variety of installation pieces (for instance, trying to influence the emotional state of the listener, exaggerate and enhance gestures using digital shadows, or replicate the physical presence of storyteller). The overall result was a raft of highly unique, interactive and visually-engaging pieces of work.

5 Reflections

The results from this project suggest that the approach of constraining narrative content and allowing open-ended technology leads to a high level of student engagement, supporting learner autonomy. In this case, it resulted in a diverse and rich set of re-interpretations reflecting learner individuality. The supportive learning environment aided students' exploration and allowed appropriate application of their technical skills. The methods employed to aid critical reflection were effective, for whilst not all students maintained a blog, the ones that did produced more insightful work and clearly thought about their work in a wider context. Crucial to the success of this project were the initial intensive storytelling stages where students experienced and learnt about the culture of storytelling first-hand and the success of this section would be critical in the application of this approach in the future.

Although the requirements for adopting this approach to narrative and technology may initially suggest it is intensive in both time and technology (in terms of expensive equipment and high level of learner skill set) it is felt that this approach could be adapted to less intense environments. Whilst lack of resources and technical skills would always be limiting factors far more than imagination, there would be substantial benefits in conducting shorter projects, using craft techniques or early stage design models such as paper prototyping and physical model building to explain how the retelling ideas could work without the need for full technical realisation. This case study certainly demonstrates the power of storytelling to spark creativity.

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ORIENT: An Inter-Cultural Role-Play Game

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Abstract

This paper provides a high level overview of a game called ORIENT which aims at cultural and emotional learning by engaging adolescents in a role-play with virtual characters in a virtual world. The paper focuses on defining and explaining the learning objectives, and gives an overview of how we intend to achieve these objectives using narrative concepts, affective characters, and innovative technologies for interaction.

1 Introduction

ORIENT (*Overcoming Refugee Integration with Empathic Novel Technology*) is being developed as part of the EU-FP6 project eCircus (*Education through Characters with emotional Intelligence and Role-playing Capabilities that Understand Social interaction*). The objectives of this project concern developing models within which narrative engagement and empathy can be used to understand social, cognitive and emotional learning processes through role-play. The users play the role of outsiders in an alien world and interact with a virtual environment inhabited by autonomous affective characters, which are able to express emotions on their own. In this paper we talk about ORIENT by explaining the learning objectives, intended outcomes and major technical and conceptual components.

2 Learning in ORIENT

2.1 Social and Emotional Learning

Interacting with ORIENT should lead the learners to change their attitudes towards (cognition), their negative feelings about (emotion), and indifferent or pejorative behaviour towards members of other cultures. It is aimed at the adolescent group aged 14 in order to enhance their intercultural sensitivity. Hence, it can be seen as fostering social and emotional learning as described by Elias et al. (1997), with a special focus on the responsibility and caring for people with different cultural background.

As a group based approach, it uses the didactic tool of virtual role-play, building on role-play's successes as a means to change cognition, emotion, and behaviour in school as well as in therapeutic contexts (Hungerige & Borg-Laufs, 2001) while transferring it to a safe, "as-if" virtual world. Role-play helps to develop the ability to detect and interpret the experiences of others in complex social situations and offers immediate and tailored reinforcement for appropriate behavioural strategies. It can thus directly influence the subjective evaluation of learners regarding their own social skills and self-efficacy, facilitating not only the acquisition, but also the performance of "adequate" social behaviour, for which it provides a secure setting for exploration and experiment. To be able to take over a role, the learner needs to empathise with the "role"; they need to imagine how another person (defined by the role) would think, feel and act in a given situation. Role-play can therefore be seen as a training method for empathy in social interactions, providing learners with a secure – because fictional - framework for experimenting

with different reactions to a given situation and for exploring experiences of self and other. Ultimately it helps users to alter their own behaviour and attitudes in order to better match the challenges of complex (multicultural) social encounters.

Theories of social learning (e.g. Bandura et al., 1977) and experiential learning (e.g. Kolb, 1984) suggest that a number of different aspects must be addressed in an application of this nature and help to establish generic requirements. Firstly, it is important that users can identify and acquire knowledge about “adequate” behaviour options, and for this reason a cooperative task has been selected in which success depends on overcoming cultural differences. Secondly, scenarios should feature characters that are similar to and stories that are attractive to the target group. Thirdly, the system should not only provide the learner with scenarios, but also allow them to act and interact with the characters, so that behaviour options are not only witnessed but also carried out, producing role commitment. Next, offering multimodal channels of information transfer between the learner and the model fosters learning by immersing the learner into the scenario, enhancing their engagement. It is important to offer reinforcement for interculturally sensitive behaviour choices, motivating the user to choose “adequate” behaviour options. Finally, a session in which reflection takes place is needed to ensure transfer to real world intercultural settings.

2.2 Learning Outcomes

In looking for ways to help the process of acculturation of adolescents from immigrating backgrounds, there were a number of reasons for not focusing on them directly. Firstly, they form a heterogeneous group with a multitude of cultures and languages. It would be infeasible to try to capture all these in a computer-based system. More than this, acculturation is a two-way process in which both the incoming group and the host group have to negotiate a common understanding. It was therefore decided to focus on the host group, and to foster intercultural sensitivity through the development of intercultural empathy. A dynamic bicultural identity as a result of an ongoing acculturation process should be interpreted as a resource rather than an obstacle or problem. However, to be able to really understand and value their bi- (or multi-) cultural identity as a resource in their culture of settlement, adolescents with migration background rely on the intercultural sensitivity within their culture of settlement, especially among their peers.

Based on empathy models (Davis, 1996) and Bennett’s (1993) model of intercultural sensitivity, we suggest that intercultural empathy is the ability to understand and share the thoughts and feelings of members of other cultures. Bringing these two models together, intercultural empathy builds on the general ability to empathise as far as the processes are concerned that constitute empathy in the mind of an empathic observer, but it poses more challenges in that it focuses on targets that are less similar than members of the home culture. Firstly, interculturally empathic reactions build on self-reflection and mental flexibility: being aware of one’s own cultural identity as well as being able to temporarily suppress it in order to understand the impact of culture on others (cognitive aspect). Secondly, they involve stress and ambiguity tolerance: not being afraid of others that seem to be different (affective aspect). Finally, they involve communicative skills: being able to feed the shared experiences back to others.

The ORIENT scenarios show how imaginary people - the Sprytes - struggle to reconcile their own interests, attitudes and feelings with another culture. The learner can monitor and support this process of intercultural empathy: while the Sprytes act as coping models, showing continuous efforts and gradual success in mastering their intercultural approaches, the learner can take over their attitudes and strategies more easily and effectively than if they would demonstrate well-executed behaviour, or verbalize strong feelings of self-efficacy (mastery models). While the learner takes in the strategies and attitudes of the Sprytes during the scenario, they can also act out their own attitudes and feelings towards the intercultural conflict situation through various interaction devices, providing them with occasions for passive as well as active learning (Kolb, 1984).

3 ORIENT – An RPG (role-playing game)

Subsequently, we will describe the main components of ORIENT: its back-story, its narrative structure and its means of user interaction. Other important parts of the game are the cultures involved, the characters belonging to these cultures and an Oracle which provides learning help. All these components are inter-related and form a complex structure for a role-playing game.

3.1 Story – Saving the planet “ORIENT”

ORIENT is designed to be played by a group of 3 teenage users, each a member of a spaceship crew. Their mission takes them to a small planet called ORIENT, which is inhabited by an alien race, the nature loving Sprytes. The users task is to prevent a catastrophe in the form of a meteorite that is on destruction course with the planet. This general story framework allows the users to appreciate cultural differences by trying to integrate themselves into an alien culture in order to gain the aliens’ trust and eventually work together with them to save the planet. Our future work plans include a possible further elaboration on the story by adding more cultures, so that the users can apply their learned intercultural understanding to reconcile hostile social groups.

3.2 Narrative Structure

As with our previous educational software application FearNot! (Aylett et al., 2006) in ORIENT we want to explore the possibilities of emergent narrative (Aylett, 1999). Decisions that the users make should directly affect the behaviour of other characters and as a result the story. Thus, narrative is not pre-scripted as in most games but rather emerging from character interactions. Each character in the ORIENT story is an autonomously acting agent. The main authoring work goes into the configuration of character goals, actions, emotions and motivations rather than into creating a specific plot.

3.3 The Sprytes Culture

Hofstede (1991) defines culture in terms of dimensions such as Hierarchy, Identity, Uncertainty avoidance and Gender. The culture of the tribal Sprytes is hierarchical. Hierarchy usually depends on respect and age. This is reinforced by the fact that Sprytes are militarily active and believe in using force and power to influence others and to protect their habitat. They are a collectivistic culture, which makes them compassionate with each other, and live in a group where the majority holds power. The Sprytes are highly traditional in their ways and view uncertainty as a threat but exceptions do exist in younger Sprytes. Gender is absent from the portrayed culture, and the graphical representation of the Sprytes is intended to be ambiguous from a gender point of view as shown in Figure 1.

Each character has particular goals of its own, relations with the other characters, and an ability to influence others. These goals and relationships become the basis of the conflicts in the game and in turn present the user with conflicts which are to be resolved to achieve user goals. The cultural descriptions consist of the back-story for the character, its hierarchical status, interests and relationships with other characters and the user. The goal of the user is to find interactions and acceptable social conduct at different stages of the game that interest the Sprytes and avoid enraging them.



Figure 1: Sprytes

3.4 Agent Architecture in ORIENT

The software component that drives character behaviour is an extension of FATiMA (Dias & Paiva 2005), an agent architecture based on the OCC appraisal theory (Ortony et al., 1988). The appraisal processes are influenced by the agent’s former experiences stored in its autobiographic memory (Ho, 2006). The advantage of using the OCC-model for modelling empathy is that it is – as far as we know – the only model that provides a formal description of non-parallel affective empathic outcomes. On the other hand, only a very limited subset of empathic emotions can be modelled. As a refinement, in ORIENT, we added the PSI model (Dörner, 2003), a psychologically grounded research. It incorporates all basic components of human action regulation in one model of the human psyche, allowing the modelling of autonomous agents that adapt their internal representations to a dynamic environment while deriving their goals from a

set of basic drives that guide the activity of the agent. It includes a variety of aspects that are crucial to modelling for ORIENT: the need for affiliation serves as a motivational basis for engaging in social contacts, and the emergence of emotions is rooted in a plausible model of action regulation, thus allowing for believable emotional dynamics. One of PSI's unique characteristics compared to other models of the human mind (e.g. Newell, 1990) is the explicit incorporation of an emotional model that specifies emotions as modulations of the information processing. Thus, emotions serve as quick adaptations of the agent to a specific situation and may lead to a change of belief about other agents as shown in (Lim, 2007). Since emotions drive the agent's behaviour, the PSI approach provides a feasible way of modelling empathy without a need to distinctly model empathic behaviour.

3.5 Oracle

The Oracle (Onboard Resource Agent for Cultural and Liaison Engagements) is an embodied computer character running on a mobile phone that aims at enhancing users' learning in the game. It stimulates users' reflection on the events and outcomes of ORIENT by asking suitable questions, by encouraging the recording of both personal and collective diaries, and by commenting on users' actions. It also helps the transfer of learning to real-world situations, by carrying out a "debriefing" session with users when they report back to the Oracle with material collected during the mission. The Oracle also fosters users' motivation and keeps them engaged by not disrupting the game flow, stimulating group collaboration, keeping players' focus on the task, and providing help during the mission.

3.6 User Interaction

In ORIENT, the users will interact using a WiiMote game controller, a dance mat and mobile phones, providing more natural input modes than the combination of keyboard/mouse and allowing physical movement within the real world. Furthermore having this 3-fold user interface facilitates role separation by providing each user with one of the devices. The users can learn aspects of a culture from mapping between WiiMote gestures and behaviour. Once they have knowledge of the gestures, they can use a specific gesture to signal a command. On the other hand, the Dance Mat has been adopted as a solution to the problem of navigation around the virtual world. Real world objects augmented with RFID tags can be touched via a mobile phone to perform selection of corresponding virtual objects.

4 Conclusion

We intend to evoke inter-cultural empathy, social and emotional learning by involving users in role-play and letting them interact with a virtual world populated by virtual characters from different cultures. By using novel emotional models for virtual characters, the concept of emergent narrative and physical interaction devices, we intend to provide the user with an engaging, challenging and emotional interaction. ORIENT focuses on the learning objectives by providing help and support to work in a group at different stages through the Oracle.

5 Acknowledgment

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Author-Centered Approach to Interactive Drama

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Abstract

Finding it difficult for authors to be creative with current interactive drama systems, we propose an alternative author-centered approach allowing authors of nonlinear media to smoothly and easily express themselves.

1 The Issue of Authoring

Almost two decades have elapsed since S. Smith and J. Bates (Smith & Bates, 1989) proposed a genre called Interactive Drama. Since then, several systems have been proposed and developed (Aylett et al., 2006; Crawford, 1999; Magerko, 2002; Mateas & Stern, 2005; Spierling, Grasbon, Braun, & Iurgel, 2002; Szilas 2007; Young et al., 2004).

Many researchers have observed that authoring ID is quite a difficult process (Mateas & Stern, 2005; Skorupski, Jayapalan, Marquez, & Mateas, 2007; Spierling, 2007; Spierling & Iurgel, 2003; Szilas, Marty, & Rety, 2003). Yet, we believe authoring should be considered the cornerstone of ID and research is needed to improve authoring tools and methodologies.

2 Experience Feedback

2.1 *IDtension*: Algorithm-centered design

Authoring-related approach: Interactive Drama requires new algorithms in order to overcome the conflict between narrative and interactivity.

IDtension is an Interactive Drama system which includes a narrative engine able to combine both local and global agency. Users' actions influence immediate and future events in the story while narrative interest and consistency are maintained (Szilas, 2007). Within the system, narrative is described at the level of actions (not scenes or plot points) and includes a user model aimed at estimating the impact of each possible action on the user. *IDtension* considers generic actions and specific tasks. Generic actions stem from narratology, while tasks are specific to a story. The author specifies the task, the characters and the objects. *IDtension* also explicitly processes the notion of (ethical) values - thematic axes according to which each task is evaluated.

Action selection is performed in three steps. Firstly, the Narrative Logic generates the set of all possible actions at a given time via a set of narrative rules. Then the User Model assesses the set of actions and ranks them according to their estimated impact on the user. Finally, the Theatre displays the selected action by generating the text. The system alternates actions chosen by the engine and actions chosen by the user.

While the current demo of *IDtension* combines narrative and interactivity, it remains basic in terms of artistic or entertainment quality.

2.2 *BEcool*: Authoring-informed design

Authoring-related approach: The algorithm design of an engine must favor easy to author choices over complex ones, while preserving the essential expressive power of the engine.

The Behavior Engine is a module that integrates with the *IDtension* narrative engine to represent actions in real-time 3D environments. It is responsible for grouping simple animations into larger units called behaviors and scheduling the animations in real time. Several systems were developed to carry out this task (Donikian, 2001; Loyall & Bates, 1991; Mateas & Stern, 2004) but these systems tend to sacrifice

usability for descriptive power. *BEcool* enables sequencing animations, event-based parallel animations, intra- and inter-character coordination. It does not use a programming language yet is more powerful than script-based behavior engines. This method uses the simple and visual notion of a graph to structure a behavior. *BEcool* was successfully integrated with both the *IDtension* narrative engine and a 3D game engine (Szilas, Barles, & Kavakli, 2007). However, graphs tended to become slightly complex, and were not easy to design. The approach developed in the next section incorporates authoring constraints from the start.

3 Author Centred Design

In ID, an author not only must create text, sound or images, but must create the processes that relate the user's inputs to the output. As a procedural art (Murray, 1997), Interactive Drama requires an author to think in terms of algorithms and programs, which is fundamentally far more conceptual than other forms of writing or design. When writing a book, a novelist is able to re-read his production instantaneously and edit the text accordingly. Linear narrative media have analogous intermediate products: The scenario in theater, the libretto in opera, the sketch in cartoon, etc. Nonlinear media doesn't. There is no intermediate product that the nonlinear media designer can interact with in order to get a good perception of what the final work will be. However, this immediate feedback and correcting loop is essential in the design process.

A reasonable research goal is to design and develop a tool or a series of tools allowing an author of nonlinear media to almost immediately implement his/her ideas. In what follows, we describe how intermediate steps can be developed for the animation engine as well as the narrative engine, and thus contribute to a global architecture of easily authorable pieces.

3.1 Author Centred Design of an Animation Engine

Considering that from an authoring perspective animation constitutes a bottleneck in developing Interactive Drama, designing an animation engine that allows easy authorability would ease the work flow.

Taking the example of 3D modeling and character animation, we understand that modeling characters requires highly specialized graphic designers, important time resources or advanced algorithms for generating movements using procedural animation. This situation not only constitutes a practical burden to the development of convincing works but also is incompatible with the very nature of the interactive medium. The desired animated outcome needs to be reconsidered.

Given the above considerations the engine and authoring tool targeted by this research will enable an author to quickly create a world, a character, or an animation. By putting the authoring priority first, some characteristics need to be downsized, including realism, quality of rendering and range of behaviors.

3.2 The Difference Uses of the Engine

Before describing the minimalist animation engine itself, it is most important to describe its uses.

The sketchpad: The animation engine could be used to foster the creativity of the author. Like a sketchpad, authors could experiment with their ideas and get immediate feedback. The outcome of the engine would consist in authors' innovative ideas for new virtual agent based pieces.

The prototype: The outcome of the creative (prototype) engine would be used to communicate about the product with other people, but it would not be reused directly in the final product (or next stage prototype).

The final product: To reach the goal mentioned in the previous section, it is necessary to drastically reduce the realism of the characters. Our investigation might be the occasion to get rid of the movie model (avoiding the goal of realism) and start with new constraints. The animation engine envisioned in this paper could be used to produce end pieces enabling the author to express his creativity, while steering clear of typical virtual agent-based animation.

3.3 Minimalist Animation

Animation can be drastically reduced to simplistic models. Characters modeled with a single geometric shape do not need limb animation or coordination. Animation becomes reduced to character's displacement. To express what is related to limb movements, the author can use text. For example, if a character (Y) is waving at another (X), a bubble displaying "waving towards X" will be attached to character Y. Another parameter that can be easily authored is the distance between characters or objects involved in the animation. For a "kissing" or "fighting" animation, the distance would be minimal, while for a "greeting" or "laughing at" animation, the distance would be larger.

The velocity profile is a feature not commonly used in virtual worlds. In a standard walk, velocity quickly reaches its maximum value and quickly returns to zero when arriving at destination. In addition to the choice of this max value (the character's speed), other velocity curves or profiles could be defined by an author, similar to the profiles used in Adobe Flash. An oscillating curve could for example express a hesitating character, while a saw tooth curve could express a sneaky character.

What is interesting here is that by starting with a strong constraint on authoring, we came to some interesting expressive features that were not used with advanced visualization. This fully illustrates that starting with strong authoring constraints does not necessarily limit the expressive power of the medium. More valuable parameters could be added, as long as they provide expressive power to an author, without adding significant authoring effort.

4 An Authoring Architecture

Each engine that constitutes an ID system (narrative, text generation, behavior, animation, etc.) should follow the same approach as described for the animation engine. The design of the authoring tool should occur at the same time as the design of the corresponding engine itself to ensure that the authoring tools are integral parts of the ID system.

An architecture that includes all levels of ID (narrative, behaviour, animation) as well as all functions (execution, authoring, monitoring) is depicted in Figure 1.

The runtime engine alongside additional modules ensures the execution of the digital story for the end user. The engines are structured according to a hierarchical decomposition of story management. Additional modules are simply sub-modules of the main modules (i.e. speech synthesis). All information describing one specific story is stored in the content, including higher level narrative content, behavior specification and character animations and models. Authoring tools are used to enter content into the system with author-oriented GUIs. The architecture will be designed such that, whenever possible, content can be added/modified during execution. The monitoring tools serve two main functions: viewing « behind the scenes » of a given execution and testing certain behaviours by shortcutting other modules. All these modules will exchange information as messages written in XML.

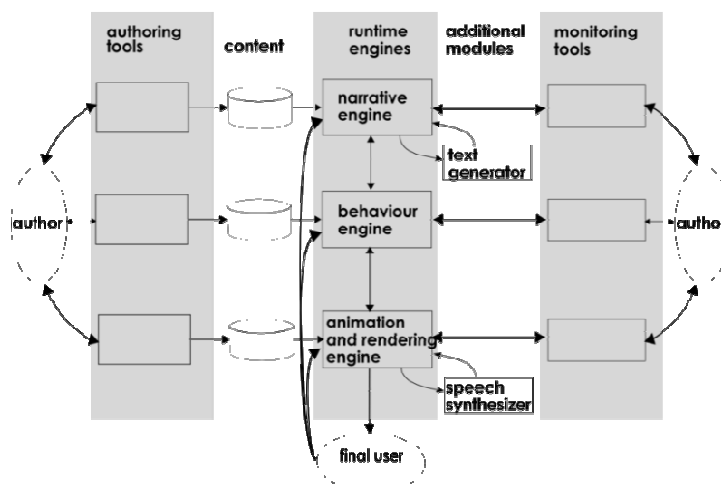


Figure 1: General architecture of an author-centered Interactive Drama system

5 Conclusion

We have suggested in this paper a design approach of an ID system that favors authorability over algorithmic sophistication. This approach, favoring expressivity, inspired the design of a global ID architecture that includes authoring and monitoring facilities.

The development of this architecture will be driven by three “target applications”, to ensure that constraints from authors themselves guide the design of the different modules. These applications are:

- literary fiction, in collaboration with an art school in Switzerland;
- education for sustainable development, in collaboration with a Swiss organisation for international cooperation;
- distance second language learning, for mutual second language learning via narrative interaction.

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A Web-based Narrative Construction Environment

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Abstract

This paper describes a web-based environment for constructing narrative from story snippets contributed by a community of interest. The underlying model uses an argument based structure to infer the next event in the narrative sequence. The approach makes use of both events and higher level story elements derived from Polti's dramatic situations. Dramatic situations used are consistent with a theme, and events are generally constrained by the dramatic situation. The narrative generated is a function of the event history, the dramatic situations chosen and the plausible inferences about next events that are contributed by a community of interest in the theme. At this stage, a player's actions are simulated using a random selection from a set and the implementation of a nonsense filter. Example outputs from the system are provided and discussed.

1 Introduction

In our model, a story is comprised of sequences of dramatic situations drawn from the thirty six categories annotated by (Polti 1927). A story may commence with a sequence of events that we call a *story snippet* which instantiate the Polti dramatic situation *daring enterprise*. This situation involves a bold leader, an object and an adversary. A sample snippet labelled *Robin entering the archery competition* includes Robin as the dramatic situation's *Bold Leader*, the trophy as the *Object* and the Sheriff as the *Adversary*. A snippet contains a sequence of event choices such as *Robin [does/does not] enter the archery competition* and actual events such as *Robin does enter the archery competition*. The theme, in this case, *Robin Hood*, describes the setting and characters permissible.

Our model develops the narrative by invoking a procedure to infer the next dramatic situation from the current dramatic situation and the outcomes of recent snippets. An inference procedure selects plausible event choices from a database derived from an audience or community. The community contributes to the construction of a narrative by subscribing to a specific theme (such as the Robin Hood theme) and supplying relevant snippets that instantiate dramatic situations. The community also contributes what is thought to be the next most likely events given the current dramatic situation and event history. Using a community of people to develop the inferences means that a large human knowledge of narrative, drama and character responses are captured in the inferences that are used to generate narrative dynamically.

An inference generated from a community supplied case base, takes into account an inter-dependency between plot and story in that the most plausible next Polti dramatic situation, which could be the continuance of the current one, is inferred from the current dramatic situation and the recent history of story events. The approach is in contrast to artificial intelligence planning approaches that, in general, search for all possible action sequences that will achieve character goals given a state of the world (Young et al 1994).

Louchart and Aylett (2004) proposes that we can consider different levels of emergence in narrative based on the level at which we allow or enable improvisation. Narrative can be seen to have a hierarchy of levels that may be represented as, overall plot, plot elements (dramatic situations might be one example of these), character-level abstract action sequences involving cognitively or reactively determined physical behaviour. The architecture used in this paper allows improvisation at all of these levels. The overall plot is not predetermined, the sequence of dramatic situations is not predetermined, character actions exert a definite effect on what happens next but not in a completely repeatable way (as determined by an external observer) and actions performed by supporting characters are determined by the history of previous events and the dramatic situation as well as character actions. So the end narrative has high levels of

emergence from this perspective. The basic decision in an interactive narrative is to determine what happens next. From the myriad of possibilities we want to choose an event that is believable and interesting within the context of the overall narrative.

The use of an inference procedure in the way advanced here draws on an approach for representing knowledge called the Generic Actual Argument Model (GAAM) by (Yearwood and Stranieri 2005). This model has been applied to the development of numerous decision support systems in law including; Split Up, predicting the percentage split of assets a Family Court judge awards divorcees (Stranieri et al 2001), Embrace, assessing the strength of claims for refugee status (Yearwood and Stranieri 1999), GetAid, determining eligibility for legal aid in Victoria (Stranieri et al 2001) and witness selection in Scotland (Bromby and Hall, 2002).

A sample narrative is provided to illustrate the approach.

2 Sample narrative

We can use the main theme *Robin Hood*, decomposed into sub-themes such as *rebellious against tyranny*, characters including *Maid Marion*, *Prince John*, *Sheriff of Nottingham* and settings such as *Nottingham Forest* to define events for that dramatic situation. We imagine an actor engaged with a system to generate a narrative. This may ultimately be implemented as a player in a 3D game environment performing actions. The narrative commences with the system selection of a dramatic situation. Figure 1 illustrates this is the snippet that instantiates a *daring enterprise* situation and includes events to do with winning a golden arrow. The starting event is a variable that represents that the bold leader does or does not enter the competition. The actual event, *Bold leader does not enter the competition* is a terminating event in this snippet and signals the need to select a new snippet by inference from the database. Figure 1 illustrates that the actor has in fact selected that choice, the *Bold leader does enter the competition*. This is called an action. An inference procedure is invoked to infer a plausible next event choice from a database of snippets. The event choice *Bold leader shoots in or flees is presented*. The actor selects the action *shoots in* and the inference procedure infers the next event choice until a terminating event is reached. In that case, the inference procedure is required to infer the next snippet that typically instantiates a different dramatic situation.

The model outlined in Figure 1 extends the approach described by (Yearwood et al 2006) and illustrates the model that has been implemented on the website <http://phoebe.ballarat.edu.au/NarGame/>. Currently a database of snippets sufficiently large to enable inference procedures to learn from past snippets has not been assembled. The current implementation simulates an inference with random selection. A sample story generated in this way is reproduced below. However an issue that arises is the need to eliminate next events and next snippets that are non-sensical. For example, if Robin is jailed as the terminating action in one snippet then he ought to be still in jail in the next. The next section describes steps toward the implementation of a nonsense filter for this purpose.

3 Filtering nonsense

A set of rules has been constructed to reduce the possibility of ‘nonsense’ stories being created. The rules act as a nonsense filter, attempting to allow only those snippets that could follow the previous dramatic situation, given the event actions. A simple example of this is when the main character (Robin) is in jail or has been injured at the end of a dramatic situation. The next dramatic situation must start with the same context values. Robin escapes from jail, or Robin is being nursed back to health. This rule is labelled Last Context Variable (LCV) – where the value in the previous context variable must match the starting context variables in the next DS. The rules are formalised in a grammar that control the sequence of snippets/dramatic situations.

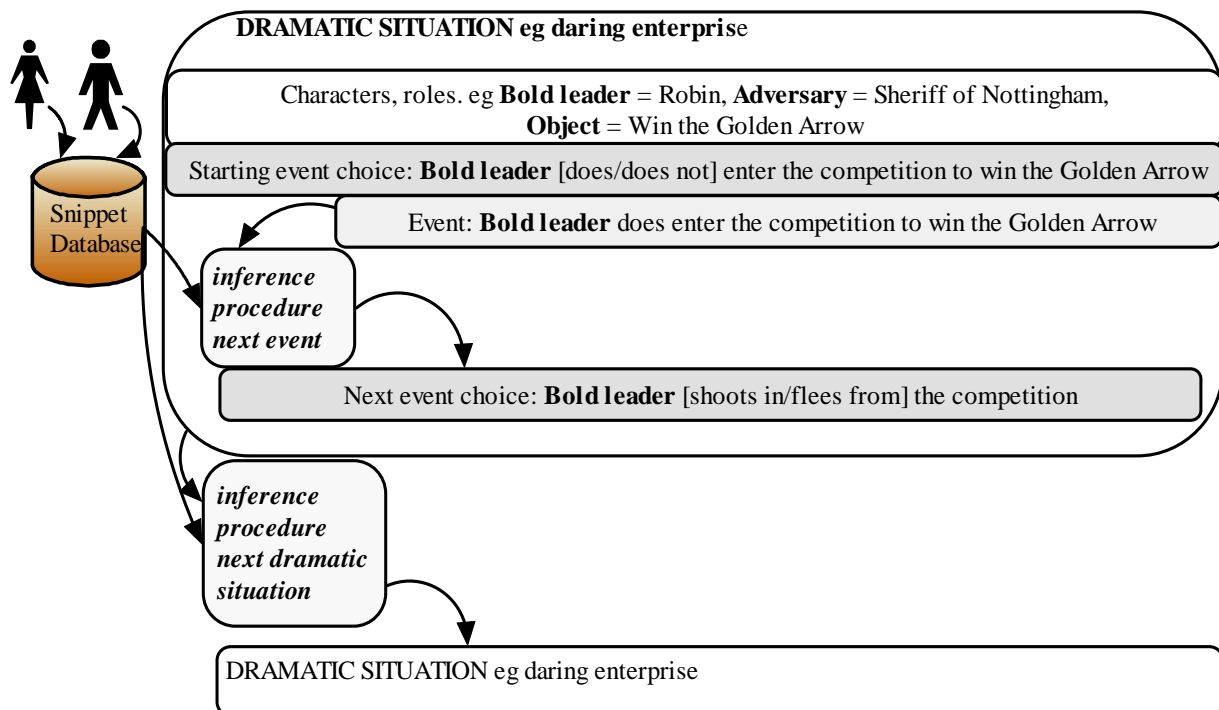


Figure 1: Illustration of the Model

The Previous Context Variable (PCV) rule disallows actions that rely of a previous action taking place. An example of this is when a story snippet requires a particular member of Robin's band to be present. If that member has not joined the outlaws, the story snippet cannot take place. The example constructed story included below begins with a story snippet concluding with Little John not joining the outlaws. In this case Little John cannot be included in story snippets later in the story. The rules are attempting to make the overall story a more readable, believable story.

4 Generated story

Below is a series of story snippets which make up a story. It was randomly generated using the inferences that have been stored in the database. Each snippet is generated by the system by putting together events. The snippets are sequences by random selection from the database with filtering rules. It can be seen that there are problems with connection and coherence between the snippets. This is attributable to the random selection and is expected to be remedied once sufficient snippets are collected for inferences. A web-site that assists contributors has been developed and provides a start for a story and simply asks 'what happens next'. This simple device seems to support the contribution process. The Story submission site is at <http://phoebe.ballarat.edu.au/collection/>

Robin has to cross a stream using a fallen tree on his way to Nottingham. At the same time another man named Little John is crossing. Robin and Little John do battle for the right to cross the stream, and Robin wins. Little John does not join the outlaws, instead choosing to make his way to the village by himself. Robin returns to camp alone.

Maid Marion has been lady-in-waiting for the Sheriffs daughter and the Sheriff has become suspicious of her loyalty. The Sheriff was approached by a man who was seeking a wife for his son and the Sheriff has agreed to the marriage. Robin hears of the danger to Maid Marians freedom. Robin believes that Maid Marian will be safe in the marriage to the man's son. He does not respond to Maid Marians plight and allows the marriage to take place.

Robin was standing under a green tree by the roadside. While he was listening to the birds among the leaves, he saw a happy young man, dressed in a fine suit of bright red cloth, passing by. Robin says to himself that he will not trouble the young man as he is obviously on his way to his wedding. The next day Robin stood in the same place and seen the same young man travelling the road again. This time the young man had no fine clothes and sighed as he walked. Robin stepped out in front of the young man and asked him for money. The man offers a gold ring as his fiancé has been betrothed to a rich old man, and they are currently

travelling to a church to marry. Robin cares not for the young man's sad tale and sends him on his way having relieved him of the gold ring.

5 Conclusion

This paper describes an approach to interactively generating narrative. Whilst most approaches to the generation of narrative have operated at the event level this approach makes use of both events and higher level story elements called dramatic situations that overcome many of the problems of an event based approach.

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Storytelling as a Link between Formal Knowledge and Actual Performance in a Critical Transformative Design Environment

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1 Introduction

In curricula for higher education in the field of engineering competences such as cooperation, user orientation are difficult to describe in prescriptive way. Industries and enterprises call for more team oriented and organizational competencies. They are looking for ‘social-able’ employees, with up-to-date domain expertise, proficient communicators, creative problem solvers and above all flexible team workers. Individuals working in teams, within or across companies will have to acquire versatile abilities, a combination of hard and soft skills to participate in a working life based on ‘knowledge productivity’; a concept in which Kessels relates the required broad professional skills (competencies) to generic learning abilities. Knowledge construction in organizations determines the continuous improvement of existing products and services and the development of new ones. (Kessels 2001). ‘Knowledge-ability’, and versatile social-ability are essential to today’s competent professional behavior. Design-professionals need to learn to focus on users, consumers and clients as co-developers of a product. It is important that students learn to create and to work with environments in which social critical and changeable acting is possible. A learning environment should be made ready for students and staff as critical transformative rooms (Crutzen 2003, 2004, 2005). Telling about their own experiences, reading and reflecting on experiences of other students in a learning environment could broaden their view on the use of technology in future design processes and in other interaction communities.

2 Knowledge-ability in a competence based learning environment

As ‘knowledge-ability’, the power to learn to create new solutions, and situated competent behavior become thriving forces in our economies, the educational debate intensifies on how to meet future professionals learning needs adequately (Brown 2000). Traditional training approaches, strong in predefined transfer of domain expertise and skills in well-defined and prestructured instructional settings will not suffice.

Education has to provide domain specific competency growth together with supportive social competencies applicable to ill-defined problems in rapidly changing contexts. For professional life the learning ability will become predominant over the traditional learning procedures embodied in traditional formal training structures. Responding to these demands a transformation of the content and the learning dimension of a design course in the field of engineering is necessary.ⁱ Hence learning by doing through immersion in the authentic setting of future professional practice might prove to be a successful answer. Transfer of informal knowledge, gained in the actual learning and working process, to future students is necessary, because it imitates the transfer of informal expertise in a company.

3 The change of routine acting: design

What students know and understand is grounded in perceived experiences from their interaction in the worlds they live in: their study and their professional job. (Jonassen 1991 p.10; 1994 p.34-35) In these worlds they have developed routines and habits. A learn-work environment for designing in a team should give students the opportunity for doubting their obvious acting, questioning the behavior of others and transforming their habits developed through participating in the interaction worlds of engineering. They should experience that aberrant behavior and deviant ideas from the dominant meaning about hardware, software, methods, theories and acting are not errors or failures. Students questioning dominant discourse are not dissidents but they are developing an academic attitude of reflection and doubt.

Changing 'routine acting' is always very difficult and a lot of people see doubt as a feeling of insecurity and creating doubt as an unpleasant activity and not as a necessary prerequisite for change. In every interaction world, there are mutually accepted or enforced habits and routines. The focus of the engineering disciplines is to create security and nonambiguity. So it is likely that the culture of engineering discipline differs from the culture of the worlds in which their products will be used. The invisibility of 'routine-acting' is precisely the problem of designing products for users in other interaction worlds. Designers should experience that the meanings of their products are always socially negotiated. 'Design' implies the possibility of change and changed acting in the domain where products are used.

In a constructivist learning process of integrated learning and working in an virtual setting the collaborative construction of knowledge happens in two ways: through internal negotiation and through social negotiation in and between teams. Success of collaborative knowledge construction and the sharing of constructed realities depends highly on successful social negotiation of meanings. With respect to this particular point Hiltz points out that "*The social process of developing shared understanding through interaction is the 'natural' way for people to learn*" (Hiltz, 1994, p. 22). However it is important that the social negotiation should not focus on coming to a shared equal understanding as soon as possible, but only to a mutual actability in which differences and multiple representations of reality are respected, and in a sense of change also appreciated. Repeated presentations and interpretations of actions create interaction worlds, spheres of discourses. This determines the learning possibilities of the individual actors. Through these learning in interaction worlds actors can change old and develop new habits and routines: individual competencies for working in a team.

4 CBE and critical thinking

Learn-work environments for competence based education (CBE) are ready-made environments. The question is how they can be open enough so that the prescriptive elements for acting in this environment can be present and that prescriptivism can be experienced as useful and doubtful simultaneously. Creating and supporting such critical transformative learn-work environments is balancing in the actual interaction between the frozenness of the established acting and the frozenness, which occurs by too much insecurity. A room for such a mutual actability should be based on a concept of work and study support by giving stimulus and impulses. Such support is situated and cannot be planned completely in advance. Not only the staff of the course should give support but support could be given by other student (teams) by letting the actual team know that they have had similar problems.

5 E-environment for competence based teamwork

Organizing CBE-based teamwork in a setting of distance education with the purpose that this teamwork should contribute to the individual competence growth, is difficult. Although the web has proven to be a good alternative for overcoming the geographical distances between students and tutors, and has created an awareness of an interaction world of study, it has also changed the attitude of students in distance education. They ask for more personalization: they feel that studying with individual pace and the team oriented study approach are in conflict. They think that communication, coordination and cooperation tasks are just time consuming and not effective for the individual learning process. In the context of competence based learning and team-orientation the web should facilitate 'interaction' and 'presence' between students and tutors.

6 The internal knowledge management (KM)

Knowledge transfer between teams which are mostly working asynchronous and for different projects is only possible with a lot of effort by the students. An evaluation of the first five teams in the design course showed a serious problem to solve (Oord, 2004). Students experienced an overload of formal information produced by the staff and previous teams for performing their tasks. This problem increased because the growing amount of information went together with a decrease of accessibility. The mere existence of

electronic facilities and a well-defined structure for storing team documents was no guarantee that new knowledge was meaningful constructed, accessible and reused by future teams. Formal knowledge transfer was done by the students only within their own project horizon and was hardly accessible for future teams, mainly focused on the production of knowledge, not on reuse. There is no link between formal acting and knowledge on one hand and the actual acting, mostly informal and anticipating on specific situations on the other. And students are not very keen telling how they have acted, because they think that every description of their acting could be used by the staff for judgment and assessment.

7 Why storytelling

According to Snowden (Snowden, 2000) the key of using storytelling as a disclosure technique is having groups of social cohesive communities who will have a sufficient body of common experience to enable a story base to emerge. Design teams in a learning environment are communities of practice. They share a common interest and task and have a time-bounded experience for good and ill (Snowden, 2000).

The aim of storytelling is sharing experiences, tips, failures and successes with current and future design teams in an informal, readable way that could be very close to their own experiences. Storytelling can “engage, involve and inspire” staff and students, “using language that is more authentic and a narrative and “provides the context in which knowledge arises as well as the knowledge itself, and hence can increase the likelihood of accurate and meaningful knowledge transfer.” Stories can “communicate ideas holistically” in an “easy-to-understand form”. The emotional component of stories can help students to articulate tacit knowledge and to tell implicit knowledge wrapped up in their own interpretation. Stories are open for reinterpretation and can be connected to the own interest. “Stories are memorable and (...) can provide a ‘living, breathing’ example of how to do something and why it works”. Stories can lead to direct action - they can help to close the ‘knowing-doing gap’. Reading and producing stories is learning in an open transformative and amusing way. Slandering incorporates always the challenge to search for the truth, the lies and all interpretations in-between.

So storytelling could be a helpful mediator between the formal description of the duties and the acting of practice in a learn and work environment. It could have the potential of creating doubt, a necessary condition for a critical transformative learn and work environment, transferring informal knowledge between team members, teams and towards future teams, linking formal acting and informal creative acting, helping future teams how to act in insecure situations, showing the link between the working and learning process and telling what means CBE in the practice of a course. Students show and discuss their competences by writing stories. It depends on the engagement of students if storytelling could be supportive.

8 The process of design and implementation of storytelling

The expectation of the staff was that a participatory design project with the students could guarantee meeting the goal of KM to create a “critical transformative room”. At the beginning of the study period 2004-2005 an iterative design and implementation process for renewing KM was started. The knowledge managers (a student role in a team) of a number of successive and parallel teams adopted the idea of the staff for storytelling as a form of KM.

At first the knowledge managers of two teams (2004-2005) have designed a procedure for storytelling that was workable for their own teams on the basis of the existing situation. The target groups for this design were the actual active teams and also the future teams. The team members of the knowledge managers have participated in the design process and discussed the procedure and the way in which it should be carried out. The result of these efforts was that each team member wrote a number of stories, whereupon the managers wrote cover stories to indicate the interrelationships between the stories. These products are transferred to the knowledge managers of three following teams in 2005-2006. They have refined the procedure and made the functional specifications for an electronic environment that could support the storytelling procedure. On that basis they searched for a suitable webbased open source

application and have chosen Plone. This choice was particularly based on the feature of defining a workflow for the storytelling procedure in the application. Also the possibility of commenting already placed stories was an important requirement. In their first prototype they implemented the agreed workflow and have shown that the system met largely the requirements. At the start of the two following new teams the prototype is turned into a more final product. Students can read all stories, comment on them and tell new ones. The commenting is important: future students can make visible their own interpretations and add useful links to the formal, general or specific team documents of the design course.

9 The workflow of a Story

In this new system a story is initially created in a strictly personal folder. Stories in this state are only accessible by the author. The author can submit the story for review by the knowledge manager. Upon entering the system, the reviewer's attention is drawn to the 'Revision list' where the entries to be reviewed are automatically listed. 'Reviewing' here means changing the contents and properties of the stories to make the stories 'fit' in the story-hierarchy. The reviewer alone is responsible for these actions. After the final publication by the reviewer the story is accessible for all students.

10 The structure of the "unstructured" Story Base

The stories do not have a predefined structure and are not restricted to certain subjects. A story is just a piece of free text, sometimes with graphics, and contains meta-information about author, publication-date and keywords. Searching in these stories is supported by different techniques:

- **Using keywords** This is a means to classify stories along more dimensions, for example in time (periods), in working-categories, in activities and so on. While reading a story, a list is presented of other stories that use the same keywords. Jumping back and forth between related stories is easy as long as the used keywords are significant and the list of related stories is not too long.
- **Full text searching** This is based on all words in the stories. Extended search enables searching on text, title, keywords, publication date and author.
- **Search folders** The content of search folders is dynamically determined by a set of criteria. These search folders can e.g. be used to filter stories from certain authors or teams, and/or on certain subjects. The content of these folders is refreshed every time it is accessed.

11 The content of the Story Base

After the engagement of 5 teams the story base is filled with 92 stories. In one story on "story telling" a student gave an overview on possible subjects:

- "Our project" (stories which concern your project)
- "Tutorials" (stories with tips and/or best practice concerning a certain subject)
- "Complain & critical department" (basic idea: I find it this way heavy/difficult/not nice/why I must this or that?)
- "Nonsense" (humor, ironic, stupid subjects)

He also gave the advice that stories should not be the channel for one's frustrations but should be a positive support for future employees. A lot of stories have links to relevant formal knowledge. Mostly individual good and bad experiences in the design course are reported, accompanied with advices. Not all stories are just positive: a lot of critical remarks are made on the concept VC as a learn work environment for distance education. The most popular themes are "competencies" and "assessment", because that is the part of the learning process that most students are not familiar with. For the working process a lot of stories are related to planning. Students are frustrated that many activities consume more time as planned, especially when the client interactions are not always going very smoothly.

One of the difficult issues for every team is building up a team communication structure. The story base reflects the communication problems. A lot of advices, technical and organizational are given. This kind of stories might prepare future students by helping them to build alternatives and flexibility in their internal and client contacts.

12 Conclusion

Storytelling could support the informal knowledge transfer in a design course. It needs additional effort of the staff to motivate student teams telling their stories.

With the storytelling process the prerequisites of a constructive learning environment are enhanced because knowledge and skills are best acquired in the context of a real life experience, preserving the complexities and uncertainties of real life. Storytelling enables team members to be connected over time and allow negotiating the constructed meaning in the design course intensively and differentiated. The stories of the students represent their work and they are the persons who are “making the show happen”. Their stories and the formal information of the staff “fashions a web of stories” in which the tension of a constructive learning process can be perceived (Boje, 2001, p. 8, 61). The stories express the fragile balance between the prescriptive elements and the variety of free choices in competence based design course.

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i This paper is based on the experiences in a design course (400h) in the Bachelor curriculum of the School of Informatics, Open University of the Netherlands in the period 2001-2007. The course was competence based and was represented as a Virtual Company. In this virtual Company students have the role of employees of this company. (Bitter-Rijkema 2002, Oord 2004, Oord 2007, Rutjens 2003)